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EDITORIAL

Dr. Rekha Jagadish
Editor in Chief
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Greetings to all.

"*Knowledge has a beginning but no end*"

On behalf of the editorial team, I extend a warm welcome to our readers and thank our authors, editors and reviewers for their valuable contributions to this issue.

We are particularly proud to present this journal and hope you find the diverse range of articles stimulating and provoking. We are committed to providing a platform for insightful research and engaging contents and we look forward for your constant support and participation.

With Regards,

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2025

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PRESIDENT 'S MESSAGE

Greetings to all

"Every smile is a work of art, and every tooth, a testament to our commitment to excellence."

It is with great pride and enthusiasm that I present this inaugural message in our IDA Bangalore Branch Journal. As I step into the role of President, I am excited to embrace the challenges and opportunities that lie ahead, and I am deeply committed to advancing our shared vision of excellence in dentistry.

Our association has long been a beacon of innovation and collaboration, fostering an environment where dental professionals can thrive, learn, and contribute to the broader dental community. This journal stands as a testament to our commitment to knowledge-sharing and academic excellence. It serves not only as a platform for the latest research and clinical advancements but also as a forum for insightful discussions and the exchange of ideas that drive our profession forward.

In this era of rapid technological and scientific progress, our focus remains on elevating patient care and advancing the standards of dental practice. Through continuing education initiatives, groundbreaking research, and community outreach, we are dedicated to nurturing the next generation of dental professionals and ensuring that our field remains at the forefront of healthcare innovation.

I extend my heartfelt gratitude to all members, contributors, and our editorial team for their unwavering support and commitment. Together, let us build on our rich legacy, celebrate our achievements, and pave the way for a future marked by excellence and transformative progress.

Dr. Shivu M E
Hon. Secretary
IDA Bangalore Branch

SECRETARY 'S MESSAGE

Warm Greetings!

It is my pleasure to introduce this first issue of IDA Bengaluru branch for the year 2025.

As Secretary I am delighted to see the high-quality research and insights that our members and contributors have shared with the community.

This journal is a testament to the dedication and expertise of our members, who have worked tirelessly to advance the field of modern dentistry. The articles in this issue showcase the latest developments, trends, and innovations in our field,and provide a valuable resource for scholars, practitioners, and policymakers.

I would like to extend my gratitude to the authors, reviewers, and editors who have contributed to this issue. Your hard work and commitment to excellence have made this journal a valuable asset to our community.

I hope that this issue will inspire and inform readers, and contribute to the ongoing conversation in our field. I look forward to seeing the impact that this journal will have on our field and the broader community.

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2024

Soft tissue growth on the oral mucosa- Iatrogenic fibroma? A Case Report

AUTHORS : **Dr. Shikha Garg, Dr. Rekha Jagadish, Dr. Rajiv N.P.**

Department of Periodontics, V. S. Dental College and Hospital, Bengaluru

Abstract:

Traumatic fibroma, also known as irritation fibroma, is a common, benign, exophytic oral lesion that typically develops because of local tissue injury. The lesion is most commonly seen in the oral mucosa, affecting sites such as the buccal mucosa, tongue, gingiva, and occasionally the palate.1 The primary cause is often persistent irritation from orthodontic appliances, restorative work, prosthetics, or other dental devices, which can be worsened by plaque or calculus accumulation.2 This case report describes an iatrogenic irritational fibroma in a 20 year old patient caused by the orthodontic temporary anchorage devices (TADs) left post orthodontic treatment which was inadvertently observed during regular dental check-up. Surgical excision was performed to remove the growth as well as orthodontic TAD.

Keywords: Fibroma, TAD, Benign tumour, Excision S

INTRODUCTION :

Traumatic fibroma is the most frequently observed benign lesion in the oral mucosa.3,4 These are caused by persistent trauma or irritation. These traumatic irritants include calculi, foreign bodies, overhanging margins, restorations, margins of caries, chronic biting, sharp spicules of bones, and overextended borders of appliances.3 These irritants cause localized hyperplasia of the fibrous connective tissue, resulting in the formation of a fibrous mass. Deley et al in 1990 gave the term Fibro epithelial hyperplasia.1 Trauma can occur in patients of any age, although the lesion is most often seen in the third to sixth decades of life. It has been noted that females exhibit a higher incidence rate, with a reported 66% female predilection.[1]

Traumatic fibromas are typically small, with a diameter of around 1.5 cm or less, though some can be larger. They are most commonly seen on the buccal mucosa, gingiva, and tongue. Rarely, they may occur on the palate due to a lower likelihood of trauma. Clinically, the lesion is usually painless and presents as a firm, round or oval, smooth-surfaced nodule with a colour similar to the surrounding mucosa, ranging from pink to flesh-coloured. The lesion may be sessile or pedunculated, with a firm consistency due to the fibrous tissue content.[3]

Traumatic fibroma should be considered in the differential diagnosis alongside fibroma, myxoma, lipoma, and pleomorphic adenoma. Treatment options include complete excision of the lesion along with removal of the irritant, cryosurgery, or intralesional injection of corticosteroids. The choice of treatment modality necessitates appropriate blood investigation .[4]

Case presentation :

A 20-year-old patient reported to the Department of Periodontology, V. S. Dental college, Bengaluru for routine dental check-up. Upon intraoral examination, an abnormal soft tissue growth in the region of maxillary left canine region was noticed. On discussion with the patient, it was revealed that he underwent orthodontic treatment 5 years ago and he noticed the growth from past 3 years with no significant concern. But the pain intensified when the mucosa was stretched during

smiling or chewing. The patient's medical and family histories were without significant findings.

Intraoral examination revealed a sessile, well-defined erythematous growth with smooth and shiny surface on the left labial mucosa, located in relation to the maxillary left lateral incisor and canine, extending from teeth 22 to 23. The lesion measured approximately 10x10mm (Figure 1), as measured with a University of North Carolina (UNC-15) probe (HuFriedy Group, Chicago, IL, USA) and was firm in consistency. The cervical lymph nodes were non-palpable. An orthopantomogram (OPG) was taken, which showed the presence of orthodontic TAD and bone resorption in the area was noticed.

TREATMENT

The oral cavity was disinfected with 0.2% chlorhexidine gluconate (Hexidine, ICPA Health Products Ltd, India). Local anesthesia containing 2% lignocaine hydrochloride with adrenaline 1:80000 (Lignox 2% A, Indoco Remedies Ltd, New Delhi, India) was then administered.

Complete surgical excision of the lesion was carried out using a #15 blade, and the lesion was completely excised (Figure 2), and the orthodontic TAD was removed (Figure 3). The excised tissue was fixed in 10% neutral-buffered formalin (NBF) and sent for histopathological analysis (Figure 4). The patient was prescribed Cap. Amoxycillin 500mg TDS for 5 days and Tab. Ibuprofen 400mg BD for 3 days and patient was advised to rinse his mouth with 0.12% chlorhexidine mouthwash BD for 15 days.

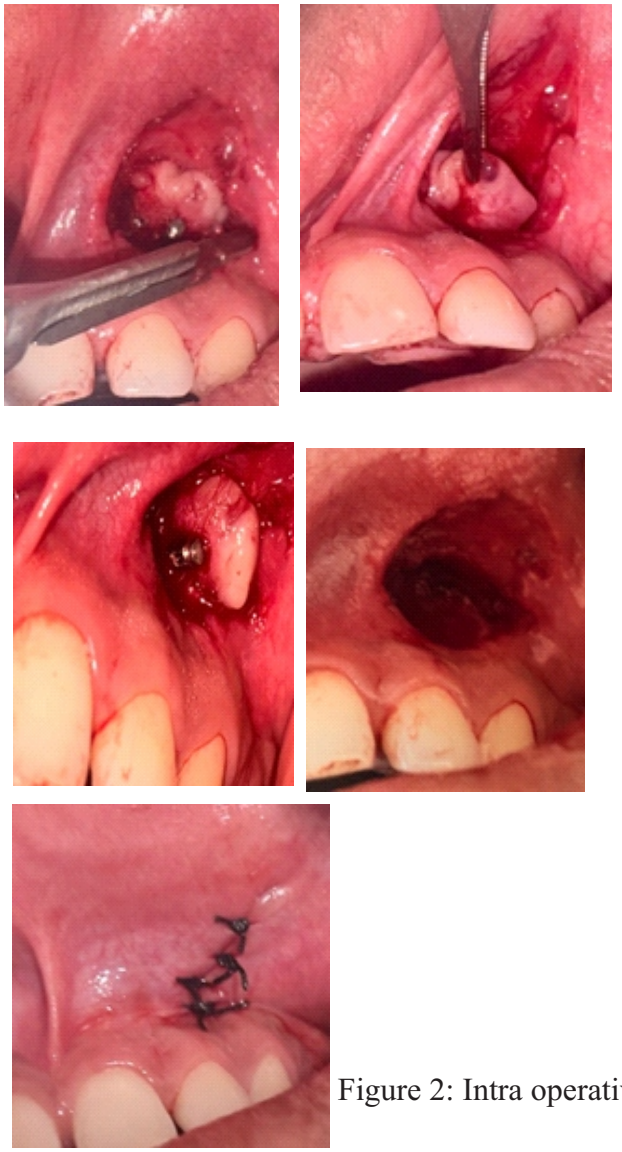

Figure 2: Intra operative

Figure 3:
Orthodontic TAD

Figure 4:
Biopsy sample

Post operative oral hygiene instructions were given and the patient was scheduled for suture removal after 1 week and follow-up appointment after one month (Figure 5).

Figure 5: 1 month post operative

Microscopic examination of H & E-stained section showed Para keratinized stratified squamous epithelium of irregular thickness with areas of hyperplasia, atrophy and ulceration. Underlying connective tissue was densely fibrous with haphazardly arranged collagen bundles interspersed with fibroblasts were noticed. Abundant areas of hyalinization were evident. Mild diffuse lymphocytic inflammatory infiltrate along with numerous thick and thin-walled vessels lined by endothelial cells are also evident. Deeper connective tissue shows lobules of minor salivary glands. In correlation with the clinical features, the overall histopathological features were diagnostic of Irritation Fibroma.

Suture removal was done after 1 week. The lesion healed without any postoperative complications, both at immediate postoperative and 1 month follow-up periods.

Discussion:

Oral mucosa is constantly subjected to external and internal stimuli and, therefore, manifests a spectrum of diseases ranging from developmental, reactive, inflammatory to neoplastic. These lesions present as either localized or generalized and may be defined as "an increase in the size of an organ or tissue due to an increase in the number of constituent cells, as a local response of tissue to injury." [5]

According to Deley et al. (1990), fibro epithelial hyperplasia is the term used to describe this reactive process, which leads to the formation of fibromas. The benign tumours of the fibrous connective tissue are called fibromas. They were first reported in 1846. [1]

Etiology

The primary cause of traumatic fibromas is irritation from various factors. It is considered the healed end product of an inflammatory hyperplastic lesion. 3 Similar lesions can also develop as a result of irritation from dental plaque and local tissue factors. Pyogenic granulomas, peripheral giant cell granulomas, and peripheral ossifying fibromas are other lesions which share similar clinical and histological features. [6,7]

A study by de Santana Santos et al. found that 15% of 1,290 soft tissue oral lesions were traumatic fibromas. In addition, Hormonal factors in females play a significant role in increasing collagen synthesis . [8]

Prevalence

Traumatic lesions are common in the oral cavity and tend to have a higher prevalence in females, with an occurrence rate of 1-2%.9 These lesions most often appear on the occlusal line of the buccal

mucosa, but they can develop in other areas as well, with an average size of about 1.5 cm .[10]

A retrospective study by Martins et al. reviewed 193 cases of focal fibrous hyperplasia of the oral cavity, highlighting that the buccal mucosa was the most common site (61.7%), and trauma was reported as a contributing factor in 90.7% of cases.8 If left untreated, these lesions can increase in size.

Histological examination

On histological examination, traumatic fibromas consist of dense fibrous connective tissue with abundant collagen fibers. The arrangement of collagen fibers can vary based on the degree of trauma and the location of the lesion. Some lesions exhibit a radiating pattern of collagen fibers, while others show a circular arrangement. The presence of fibroblasts and minimal inflammation can also be noted.[11]

According to Barker and Lucas, the collagen organization in irritational fibromas depends on the location and severity of the irritation. Two distinct patterns of collagen formation exist: radiating and circular. It is believed that higher levels of stress lead to the radiating pattern in relatively static areas (such as the palate), while lower levels of trauma result in the circular pattern in more flexible areas (such as the buccal mucosa).[1]

Differential Diagnosis

Traumatic fibromas may be confused with other benign oral lesions, including pyogenic granulomas, peripheral giant cell granulomas, and peripheral ossifying fibromas.12 These lesions share similar clinical appearances, such as a smooth surface and firm consistency, making histological examination essential for accurate diagnosis. Rarely, fibromas may be misdiagnosed as lipomas, myxomas, or pleomorphic adenomas.

Management

The treatment of traumatic fibromas typically involves complete excision of the lesion to reduce the risk of recurrence, along with scaling and curettage of the surrounding tissue to eliminate any irritants. The key principle is the removal of known irritants. In the case presented here, the lesions were caused by continuous irritation from the orthodontic TAD which was inadvertently left post orthodontic treatment completion. While the recurrence rate is generally low (8%–20%), it can occur if the irritant is not adequately addressed.[4]

Prognosis

The prognosis for traumatic fibromas is excellent, with a low risk of malignant transformation.11 Its recurrence rate is rare but may happen in case of repeated trauma at the same site or incomplete excision.12 To avoid recurrence, care should be taken to ensure that the nodule is completely removed together with a margin of healthy tissue.7 The irritant should be identified and removed, coupled with enucleation of the lesion and regular follow-up care. Long-term postoperative follow-up is extremely important because of the high growth potential of incompletely removed lesion which is 8%–20%.[3]

Conclusion:

Traumatic fibroma is a common benign lesion in the oral cavity, primarily caused by chronic irritation or trauma. It is characterized by slow, painless growth and is typically treated with complete surgical excision. This case exhibited the typical features of irritation fibroma, including the nodule with normal color, chronic irritation (orthodontic TAD) and proliferation of fibroblasts and hyperplastic collagen in histology. Histopathological examination is crucial for accurate diagnosis, and the prognosis is generally favorable with appropriate management. Early recognition and removal of the causative irritants are essential to prevent recurrence.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be

guaranteed.

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Conflicts of interest

There are no conflicts of interest

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ADVANCEMENTS IN PAIN MANAGEMENT IN PEDIATRIC DENTISTRY – A REVIEW

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INTRODUCTION

In dentistry, "pain management" refers to various procedures aimed at managing and reducing the pain patients experience before, during, and after dental treatments. Pediatric pain management, in particular, plays a critical role in shaping a child's attitude toward dental care and ensuring cooperation during procedures [1]. A significant challenge in pediatric dentistry is alleviating the anxiety and fear often associated with traditional techniques, such as administering local anesthesia using syringes and needles. These fears can make dental visits stressful for both patients and practitioners.

To address these challenges, it is essential for pediatric dentists to remain updated on modern advancements in local anesthetic delivery systems. Innovations in pain management aim to enhance patient comfort, reduce anxiety, and foster a positive attitude toward dental procedures. This article reviews recent developments in pain management techniques, with a focus on pediatric dentistry, highlighting their applications, advantages, and limitations [2].

COMPUTER-CONTROLLED LOCAL ANESTHESIA DELIVERY (CCLAD)

Computer-Controlled Local Anesthesia Delivery (CCLAD) systems are designed to administer local anesthetics at a precise and controlled pace, minimizing patient discomfort [2]. These devices maintain a constant injection speed while considering the anatomical characteristics of the target tissues, making them a popular choice for painless anesthesia delivery[3]. Prominent examples of CCLAD devices include the **Comfort Control Syringe (CCS; Dentsply, USA), QuickSleeper (Dental HiTec, France), Wand® (Milestone Scientific, USA), and iCT (Dentium, Korea)**.

Benefits of CCLAD

- **Pain Reduction:** These devices reduce pain by anesthetizing the tissue concurrently during injection. Continuous, slow administration ensures the anesthetic is delivered into already-numb tissue, minimizing resistance and discomfort [2].
- **Precision and Safety:** CCLAD systems provide precise control over injection speed and pressure, improving safety and efficacy during anesthesia administration [4].

Design Considerations

When selecting a CCLAD device, it is important to evaluate the following factors:

- **Weight:** Lightweight devices like the Wand® are easier to handle and reduce operator fatigue. Conversely, devices like QuickSleeper® and CCS® are heavier, which can pose challenges for users with smaller hands.
- **Aspiration Potential:** The ability to aspirate effectively ensures safe injection, especially for intravascular regions [4].
- **Ease of Cartridge Replacement:** Devices like the Wand® allow for cartridge replacement during anesthesia delivery but may result in

minor anesthetic loss (0.3–0.4 mL). Devices with external cartridges, such as iCT injection®, resemble conventional syringes and are simpler to sterilize [5].

Device Comparisons

- **Wand® (Milestone Scientific):** The longest-running CCLAD product, known for its lightweight design and ease of use. Its small size (half the circumference of traditional syringes) enhances operator control [4]
- **QuickSleeper® and CCS®:** These devices integrate the syringe and motor into the handpiece, making them heavier but offering a unique ergonomic design [5].
- **Comfort-in®:** A jet injection device that administers anesthetics without a needle. It is most effective for anterior teeth but lacks speed control and is unsuitable for posterior applications.

Recent Innovations

Recent advancements in CCLAD systems focus on improving operator convenience and patient comfort:

- **Ergonomic Designs:** Devices like iCT injection® and Smartject® offer enhanced grip and usability.
- **Lightweight Models:** Technological progress has led to the development of lighter devices, reducing the strain on operators during prolonged use [4][5].

Practical Considerations

Proper device selection is crucial for ensuring effective anesthesia delivery. Factors like the device's weight, injection speed, and cartridge placement can influence usability and patient outcomes. Lightweight and ergonomic designs are preferred for pediatric cases or extended procedures. Additionally, infection control protocols, such as sterilizing cartridges, should be prioritized when choosing a device.

.

JET INJECTORS

Jet injectors, originally developed in 1866 for mass vaccinations, have evolved to deliver drugs subcutaneously, intramuscularly, and intradermally [6]. They are commonly used for administering medications like insulin and vaccines such as hepatitis B. These devices use a mechanical energy source to generate sufficient pressure, creating a high-velocity liquid column that can penetrate the skin without the need for a needle. This innovative technique provides surface anesthesia and facilitates drug delivery into the subcutaneous tissue [7].

Advantages of Jet Injectors

- **Needle-Free Delivery:** Reduces patient anxiety, particularly among individuals with needle phobia.
- **Efficiency:** Enables quick drug absorption and minimal tissue damage at the injection site.
- **Reduced Risk of Complications:** Avoids side effects like needle-stick injuries and cross-contamination.
- **Dose-Sparing Effect:** Useful for intradermal vaccinations, such as inactivated polio vaccines (IPV), particularly in resource-constrained settings.

Drawbacks of Jet Injectors

- **High Cost:** The devices are expensive compared to traditional syringes.
- **Noise and Pressure Sensation:** Sudden noise and pressure during injection may frighten patients, especially children.
- **Local Reactions:** A higher incidence of localized injection site reactions compared to conventional methods.
- **Intrusiveness:** The design and operation may appear intimidating to some patients.
- **Residual Hemorrhages:** Increased risk of minor bleeding at the injection site[8].

Commonly Used Jet Injector Devices

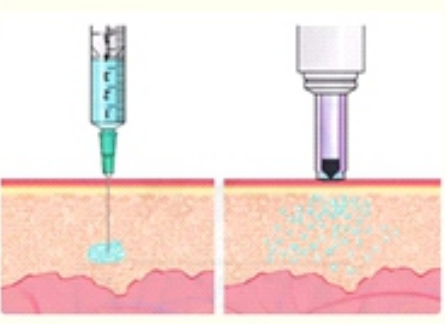
- **MED-JET (Medical International Technologies, Canada):** A reliable device for various medical applications.
- **Syrijet Mark II (Keystone Industries, USA):** Well-suited for dental and medical use.
- **LectraJet (LectraJet, USA):** Popular for its ease of use and adaptability.
- **Biojector (Bioject Medical Technologies, USA):** Known for its safety and precision.
- **PharmaJet Injector (PharmaJet, USA):** Frequently used for vaccinations.
- **Med-Jet H4 Injector (MIT Canada):** The latest model with enhanced features [9].

Working Principle of Jet Injectors

Jet injectors operate by releasing air pressure through a piston mechanism, propelling the anesthetic solution in a high-speed jet. The jet motion punctures the mucosa slightly, delivering the drug without requiring a needle. To breach the skin barrier and reach subcutaneous tissue, the jet must achieve velocities between 100 and 350 m/s. This mechanism ensures efficient and minimally invasive drug delivery.

Applications and Future Potential

Jet injectors are widely used for intramuscular, subcutaneous, and intradermal drug delivery. They are particularly advantageous for large-scale vaccination programs, where dose-sparing strategies are critical due to vaccine shortages. For example, intradermal vaccinations using NFJIs have been employed successfully for polio immunization in developing countries. Additionally, NFJIs are favored by patients with needle allergies or those at higher risk of needle-related complications [10].



VIBROTACTILE DEVICES

The use of vibratory stimuli to reduce pain during intraoral dental injections, especially in children, has garnered attention in dental research. Various techniques have been explored, including devices like the Dental Vibe® and the SMV-Syringe Micro Vibrator, as well as manual methods like cotton roll vibration. These approaches aim to use the sensory distraction of vibration to counteract the pain from needle pricks [11].

Research Findings:

1. **Effectiveness of Vibratory Stimuli:**
   - Many studies report that vibration can reduce children's self-reported pain scores following intraoral injections. The use of vibration as a counter-stimulation method was found to significantly lower pain scores in the majority of studies.
   - However, results are mixed. Two studies (Raslan et al., Elbay et al.) found no significant difference between the vibratory counter-stimulation group and the control group, which may be attributed to factors like the lack of a topical anesthetic before the injection (as in the Raslan et al. study) [12][13].

2. **Self-Reported Pain Scores :**
   - The WB-FPR scale was used in six studies to assess pain, while Shilpapriya et al. employed the universal pain scale. The data suggests that the majority of children in the vibratory counter-stimulation group reported lower pain scores.
   - Some children, especially very young ones, found vibration unpleasant and reported more pain when they perceived the vibration as an added discomfort [14].

3. **Challenges and Considerations:**
   - The effectiveness of vibratory stimuli may depend on several factors, such as the presence of topical anesthesia, the age of the child, and the type of vibratory technique used.

- Although vibratory counter-stimulation is generally helpful, it does not guarantee a pain-free experience and may not work for all children.

VibraJect

VibraJect is a small, battery-powered device that fits over a regular dental syringe and vibrates the needle at a high frequency, which is strong enough for the patient to feel. The purpose of this vibration is to reduce the pain associated with injections. However, studies evaluating VibraJect's effectiveness have shown inconsistent results [15].

Some researchers, such as Nanitsos et al. and Blair, suggest that VibraJect could be a painless injection method [16][17]. On the other hand, a study by Yoshikawa et al. found no significant reduction in pain when VibraJect was used with a traditional dental syringe [18]. Additionally, Saijo et al. assessed VibraJect when used with an electrical injection device and found no statistically significant reduction in pain ratings following the anesthetic injection or needle insertion [19].

DentalVibe

DentalVibe, introduced by BING Innovations LLC, is another device that uses vibration to reduce pain during dental injections, based on the pain gate theory. This handheld, rechargeable, and cordless device applies gentle, pulsed micro-oscillations to the injection site. The device features a U-shaped vibrating tip connected to a microprocessor-controlled Vibra-Pulse motor, which stimulates sensory receptors at the injection site. By doing so, it effectively closes the neural pain gate and prevents the unpleasant sensations typically associated with injections.

In addition to vibration, DentalVibe also includes an attachment to retract the cheek or lip and a light that illuminates the injection site, making the procedure more comfortable for the patient. This system aims to reduce the pain perception during injections through both physical distraction (vibration) and visual aids[11].

Accupal

The **Accupal** is a cordless tool designed to precondition the oral mucosa by applying pressure and vibration at the injection site. According to the manufacturer, Accupal works by closing the "pain gate" through a combination of pressure and vibration, which is applied 360 degrees around the needle penetration site. Once the device is placed at the injection site and moderate pressure is applied, the device illuminates the surrounding area and activates vibration. The device's disposable tip has a hole through which the needle is inserted, and it operates using a single AAA standard battery[11].

Effectiveness in Pain Reduction: Mohammed Nagyhamdy et al. Study

A study by Mohammed Nagyhamdy et al. aimed to compare the effectiveness of different pain management techniques for children undergoing local anesthesia injections. The study evaluated topical anesthesia (TA) (20% benzocaine), the VibraJect (VJ) system, and the DentalVibe (DV) system. The results showed that both the VJ and DV systems, which applied vibration, significantly reduced pain following both nerve block and infiltration-delivered local anesthesia (LA) injections. Compared to the control group (TA), the VJ and DV groups reported noticeably lower pain scores, suggesting that vibration was effective in alleviating discomfort during the procedure[20].

INTRAOSSEOUS ANESTHESIA

Intraosseous anesthesia involves injecting anesthetic directly into the cancellous bone to anesthetize the surrounding soft tissue, bone, and teeth. This technique is used to achieve localized anesthesia, particularly in areas were other methods, like the inferior alveolar nerve block, may be less effective [21].

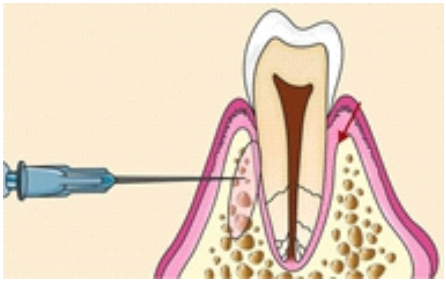
Historically, the administration of intraosseous anesthesia required innovative methods due to the lack of standardized tools. For example, Magnus used a standard 27-gauge needle to puncture the cortical plate and inject anesthetic directly into the

bone as an alternative to the inferior alveolar nerve block. His technique proved effective for adult mandibular incisors and bicuspids, as well as deciduous molars [21]. Another early method was used by Bourke, who employed a No. 4 Beutelrock drill in a straight handpiece to puncture the cortical plate. Afterward, a 3/4-inch, 26-gauge needle was used to inject anesthetic into the hole created by the drill [22][23].

Modern Intraosseous Anesthesia Systems

Over time, several systems have been developed to improve the delivery of intraosseous anesthesia. These systems are designed to inject a local anesthetic solution directly into the cancellous bone near the tooth's apex. Despite differences in design, all these systems aim to provide effective and localized anesthesia. Notable systems include:

- IntraFlow (Pro-Dex Incorporated, Santa Ana, CA, USA)



- X-tip (Dentsply International Inc., Tulsa, OK, USA)
- Stabident (Fairfax Dental, Miami, Florida) [24][25][26].

These devices represent the evolution of intraosseous anesthesia, offering more precise and reliable methods for achieving anesthesia in dental procedures.

Stabident System

The Stabident System (Fairfax Dental, Inc., Miami, FL) is one of the three commercially available devices for intraosseous injection and is widely used in dental practices. The system consists of two main components: a perforator and an injection needle.

- **Perforator:** The perforator has a diameter of 0.43 mm and a length of 0.9 mm. It is powered by a slow-speed contra-angle handpiece.
- **Injection Needle:** The injection needle has a diameter of 0.40 mm and a length of 0.9 mm, slightly smaller than the perforator. A standard dental anesthetic syringe can be connected to this needle [26].

Injection Site and Technique

The injection site for the Stabident system is located 2 mm below the intersection of a vertical line passing through the center of the interproximal papilla and a horizontal line passing through the gingival margins of the adjacent teeth. If the site falls in the alveolar mucosa, it is adjusted to the attached gingiva.

The process begins by applying a few drops of anesthetic to the area to numb the soft tissue. Next, the rotary perforator is placed perpendicular to the cortical plate and pushed through the gingiva in brief, slow bursts until a sensation of "give" is felt or about 2 to 5 seconds have passed. After creating the perforation, the injection needle is inserted through the hole into the cancellous bone while the syringe is held in a "pen-grip" position[27].

Anesthetic is gradually injected over one to two minutes. For posterior injections, the needle is bent 45 degrees at the hub to facilitate placement. If back pressure is encountered during injection, the needle is rotated a quarter turn and the injection attempt is repeated. If this does not resolve the issue, the needle is removed, checked for obstruction, and a fresh perforator is used to reperforate the site [27].

Benefits and Drawbacks

- **Benefits:**
  - **Affordability:** The Stabident system is cost-effective compared to other intraosseous injection devices.
  - **Compatibility:** It is compatible with standard dental office equipment, using a regular dental anesthetic syringe and a slow-speed contra-angle handpiece.
- **Drawbacks:**
  - **Site Accessibility:** The perforation must be made in the attached gingiva, which requires a visible and accessible location distal to the tooth to be anesthetized. This can be challenging, especially if the penetration site is in the alveolar mucosa, which can shift once the perforator is removed, making it

harder to find the correct spot with the injection needle.

The Stabident system remains a popular and practical choice for intraosseous anesthesia, offering a reliable method of achieving anesthesia when other techniques may be less effective. However, the technique requires precise placement of the perforator and injection needle for successful administration [27].

Cyberjet System

The Cyberjet System (Cyberdent Inc., Novato, CA) is one of the newest devices for intraosseous injection. It consists of several components: a disposable plastic transfuser that carries the anesthetic from a standard dental anesthetic cartridge, an air-driven handpiece, and a disposable 27-gauge needle that also functions as a drill. The handpiece is operated via a foot control.

To use the system, the clutch button on the handpiece is pressed, allowing both perforation and injection to occur simultaneously. For maxillary teeth, the perforation site is located at the center of the base of the interproximal papilla, while for mandibular teeth, it is positioned 2 mm below this point. Topical anesthetic is first applied to the area for a few minutes.

The needle is placed at the chosen penetration site, angled between 30 and 40 degrees relative to the long axis of the tooth. To disengage the rotation of the needle, the clutch button is moved in the direction of the motor drive. Then, pressing the foot pedal injects a few drops of anesthetic. After releasing the clutch, the foot pedal is fully depressed until a perforation is felt. Once the perforation is made, the clutch is pulled back, and the remaining anesthetic is injected. The injection rate is controlled by how much pressure is applied to the foot pedal. The needle is extracted by rotating quickly and pulling it out of the perforation site [28].

X-Tip

The X-Tip system was developed to address a common challenge with the Stabident system, which is the difficulty of locating the perforation site. The X-Tip solves this issue by converting the pilot drill into a hollow tube through which a 27-gauge needle can pass. Since the original drill bit stays in place, the anesthetic can be injected directly without the need to search for the newly created hole.

However, it has been observed that males who underwent X-Tip treatment experienced higher levels of post-operative pain 1 to 3 days after the procedure. This may have been due to the wider drill and guide sleeve diameter, which increased heat formation during perforation. The X-Tip system is no longer being produced by its manufacturer, Dentsply International Inc. (Tulsa, OK, USA) [25].

IntraFlow

The IntraFlow system (Pro-Dex Medical Devices, Irvine, CA, USA) is a dental handpiece with an integrated injection system. Its main advantage is that it allows the entire process of entry into the penetration zone, injection, and withdrawal to be performed in a single, continuous step. This can be particularly useful in hard-to-reach penetration zones, such as between the second and sometimes first molars, or in situations where there is a narrow band of attached gingiva or horizontal bone loss.

In a recent study, 13 out of 15 participants experienced reliable anesthesia for their posterior mandibular teeth using the IntraFlow system, compared to 9 out of 15 who received an inferior alveolar nerve block. However, the IntraFlow system has some drawbacks, including higher startup and maintenance costs and the potential for anesthetic leakage, particularly if the system is not assembled correctly [29].

Contraindications

Certain conditions can make intraosseous injection less effective or contraindicated:

- **Limited attached gingiva:** A small area of attached gingiva can make it difficult to achieve proper perforation.
- **Proximity of teeth:** Teeth that are too close together may not provide enough space for successful injection.

- **Advanced periodontal disease:** Advanced periodontal conditions can affect the success of intraosseous injections.
- **Thick or dense bone:** Some regions with thick or dense bone may prevent the anesthetic from dispersing effectively.
- **Restricted cancellous bone:** Areas with limited cancellous bone may not allow the anesthetic to spread properly.

Additionally, mepivacaine has been suggested as a suitable alternative for intraosseous injections in patients who may be sensitive to epinephrine or have medical conditions that warrant caution when using epinephrine-containing solutions.

This collection of systems and considerations highlights the advancements and challenges in intraosseous anesthesia techniques, offering options for various clinical scenarios while addressing limitations and risks [29].

TOPICAL ANESTHETIC AGENTS

Topical anesthetics are designed to numb the surface tissues, including skin, mucosa, or gingiva, by blocking nerve conduction at the free nerve endings. They are commonly used to reduce discomfort during dental procedures, especially before needle penetration. The anesthetic effect typically begins within a few minutes and can last for varying durations, depending on the agent and application method[30].

1. Hurripak Periodontal Anesthetic Kit

The Hurripak Periodontal Anesthetic Kit uses a 20% benzocaine solution delivered via a 3-milliliter plastic syringe with disposable tips. The anesthetic is inserted deeply into the gingival sulcus, and the effects are typically felt within 30 seconds, lasting for about 15 minutes. This kit is often used in procedures such as root planing, scaling, and full mouth debridement. It provides a precise dosage of anesthetic, ensuring that only the necessary amount is dispensed, whether for a full quadrant or a single spot. It is especially useful in periodontal treatments and can reduce the need for local injections during these procedures[31].

2. Cetacaine Topical Anesthetic Liquid

Cetacaine is a potent topical anesthetic that works well on mucous membranes (except eyes). It is often used in periodontal pockets for pain relief during dental procedures. Studies show that Cetacaine outperforms EMLA cream and 20% benzocaine gel in terms of efficacy, especially in children aged 7-11 years. Its deeper penetration and ability to resist moisture make it effective for numbing areas that are difficult to anesthetize with other topical agents. Cetacaine can be applied as a spray or liquid, and while it cannot be injected, it is an excellent non-invasive option for SRP procedures (Scaling and Root Planing). It is easy to apply using single-use syringes or cotton swabs [32].

3. Oraqix Subgingival Anesthetic Gel

The Oraqix gel is a noninjectable local anesthetic containing 2.5% lidocaine and 2.5% prilocaine, designed specifically for use in gingival sulcus and periodontal pockets during scaling and root planing. It is applied using a blunt tip applicator directly to the periodontal pocket. Upon contact with body temperature, Oraqix turns into a gel and begins to take effect within 30 seconds, lasting for up to 20 minutes. This gel is highly effective in providing localized anesthesia for dental procedures without affecting the surrounding tissues. However, it is not suitable for major dental surgeries or restorative procedures. Oraqix is a preferred option for patients who wish to avoid traditional injections during SRP therapy [33].

4. Dentipatch® System

The Dentipatch® System is a transmucosal delivery system that releases 20% lidocaine for preinjection numbness. It is particularly effective in pediatric patients, as studies have shown that it significantly reduces injection-related pain, leading to better patient cooperation. The patch delivers a controlled dose of lidocaine when applied to the mucosa, with a maximum dosage of 46.1 mg for children. After 5 minutes, the patch can be removed, providing effective topical anesthesia. The Dentipatch is an ideal solution for reducing pain

in children before injections, especially for patients who are anxious about the procedure [34].

5. Intranasal Spray (Kovanaze®)

Kovanaze® is a 3% tetracaine hydrochloride and 0.05% oxymetazoline nasal spray approved by the FDA for use in maxillary dental procedures, particularly those involving the anterior teeth. The spray provides local anesthesia by being absorbed through the nasal mucosa, making it an excellent option for patients who are needle-phobic. The combination of tetracaine (an anesthetic) and oxymetazoline (a vasoconstrictor) ensures effective anesthesia with minimal systemic absorption, resulting in a longer-lasting effect. The spray is administered in three 0.2 ml doses (one after 4 minutes) and provides safe and effective anesthesia for routine restorative procedures. It is particularly helpful in managing maxillary central incisor injuries and has shown high efficacy with few side effects [35].

Application Techniques for Topical Anesthetics:

- Hurripak Periodontal Kit: Apply deeply into the gingival sulcus and wait for 30 seconds to 1 minute for effect [31].
- Cetacaine: Apply using a cotton swab, syringe, or microbrush for precise control [32].
- Oraqix: Use a blunt applicator to apply directly to the periodontal pockets. The anesthetic starts working within 30 seconds [33].
- Dentipatch®: Apply to the mucosa for 5 minutes for effective pre-injection numbness [34].
- Kovanaze®: Administer through two 0.2 ml sprays in the nostrils, followed by a secondary application for additional efficacy [35].

Contraindications and Considerations:

- Oraqix should not replace traditional anesthesia for major dental surgeries [33].
- Cetacaine may not be suitable for patients with specific medical conditions due to its potent action [32].
- Dentipatch® is typically not recommended for children under 27 kg [34].
- Kovanaze® is effective for maxillary anterior teeth but may not be suitable for posterior teeth or patients under 40 kg [35].

These topical anesthetic agents provide valuable options for patients undergoing dental procedures, especially those seeking non-invasive solutions to manage pain and discomfort. Each has its own unique benefits and limitations, making them suitable for different clinical scenarios.

INJECTABLE ANESTHETIC AGENTS

Injectable anesthetics are crucial in dental and medical procedures for numbing specific areas, typically achieving a deeper and more sustained effect compared to topical agents.

Centbucridine

Centbucridine, a quinolone derivative, is a local anesthetic with a concentration of 0.5%. It has been found to have comparable effects to lignocaine (lidocaine) in terms of onset time, depth of anesthesia, and cardiovascular effects. Some notable characteristics of centbucridine include:

- Longer duration: Centbucridine has a significantly longer duration of anesthesia (2.5 hours) compared to lignocaine, which lasts less than 2 hours. This extended effect is due to its intrinsic vasoconstrictive properties.
- Alternative for medically compromised patients: For patients who are contraindicated for lignocaine or adrenaline, particularly in those aged 12-14 years, centbucridine is considered a suitable alternative.
- Safety concerns: Centbucridine's safety in patients under the age of 12 has not been well established and needs further evaluation.
- Uses: It is effective for both nonsurgical and surgical extractions and can be a reliable local anesthetic for dental procedures [36].

PH BUFFERING OF LOCAL ANESTHESIA

Local anesthetic solutions are often acidic, which

can cause tissue irritation and burning sensations during injection. Buffering these anesthetic solutions can reduce such discomfort and enhance the effectiveness of the anesthetic [37].

Buffered Anesthetics: Buffering an anesthetic with an 8.4% sodium bicarbonate solution ($NaHCO_3$) before injection helps to raise the pH, making the solution less acidic [38].

Effect on Injection Pain: Buffering lignocaine (lidocaine) in particular has been shown to reduce the pain associated with injection[39].

Onset Time: Buffered lidocaine leads to an accelerated onset time for procedures such as the inferior alveolar nerve block (IANB). Studies have shown that buffered lidocaine has a faster onset (e.g., –1.26 minutes for normal tissue and –1.37 minutes for inflamed tissue) compared to non-buffered lidocaine [40].

Patient Comfort: Buffering the anesthetic is particularly useful in pediatric patients (aged 5-10 years) and those with inflammatory conditions that may make the tissue more sensitive [41].

ELECTRONIC DENTAL ANESTHESIA (EDA)

Transcutaneous Electrical Nerve Stimulation (TENS) is a form of electronic dental anesthesia used to alleviate pain during dental procedures. It works by delivering electrical pulses through electrodes placed on the skin to stimulate superficial nerves, which helps in pain relief. The mechanisms behind the effectiveness of TENS are primarily explained by:

1. Endogenous Opioid Theory: TENS stimulates the body to release its own natural pain-relieving chemicals (endorphins), which help to block pain [42].
2. Gate Control Theory: According to this theory, the electrical stimulation from TENS interferes with pain signals traveling to the brain, effectively "closing the gate" to the pain sensation [43].

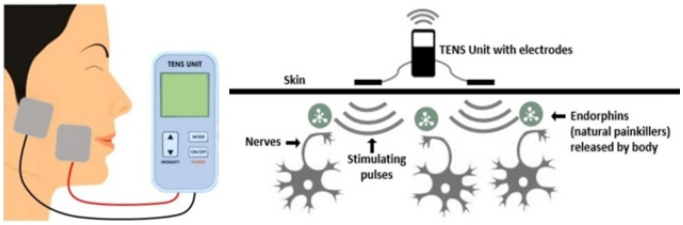
Uses and Benefits of TENS in Dentistry:

- Pain Relief: TENS has been successfully used to relieve muscle spasms in conditions like myofascial pain dysfunction and to manage trigeminal neuralgia and atypical facial pain [44].
- Pain Reduction in Pediatric Dentistry: Research by Choudhari SR et al. showed that children aged 8 to 12 who received inferior alveolar nerve block (IANB) injections along with TENS experienced a significant reduction in pain compared to those who received only topical 20% benzocaine [45].
- Increased Comfort During Injections: Studies, including one by Siddiqui et al., found that TENS can be a highly effective adjunct for local anesthetic injections in pediatric dental patients, reducing pain and discomfort during minor dental procedures [46].

Contraindications:

TENS is generally safe for most patients, but it should not be used in individuals with certain medical conditions, such as:

- Pacemakers or Cochlear implants
- Heart conditions
- Neurological disorders (including epilepsy) [47].



IONTOPHORESIS IN DENTISTRY

Iontophoresis is a non-invasive technique used for local anesthesia in dental procedures, providing a needle-free alternative to traditional anesthetic delivery. The process utilizes an electric current to drive positively charged anesthetic agents, such as lignocaine and adrenaline, into deeper oral tissues after topical application. This method can enhance the delivery of anesthetic agents, improving patient comfort during procedures.

Key Benefits:

- Needle-Free: Since there are no injections

involved, iontophoresis improves the patient-dentist relationship, especially for patients who are anxious about needles [48].

- Deeper Tissue Anesthesia: The electrical influence enables deeper penetration of the anesthetic agents into the tissues [49].
- Faster Onset and Prolonged Duration: When used with a pH 7.0 drug combination, iontophoresis can accelerate the onset and prolong the duration of buccal anesthesia, as demonstrated by Cubayachi et al., who showed an enhanced mucosal accumulation of prilocaine hydrochloride and lidocaine hydrochloride after iontophoresis[50].

Mechanism of Iontophoresis :

The process of iontophoresis is based on three mechanisms:

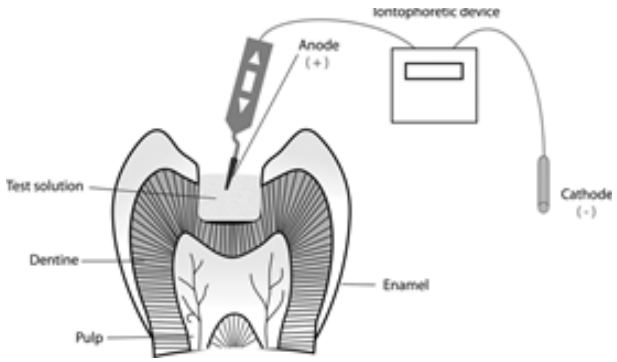
1. Electrophoresis: Positively charged ions are repelled by the anode, and negatively charged ions are repelled by the cathode. This mechanism helps drive ionic drugs into the tissues [51].
2. Electro-osmosis: In addition to ionic drugs, neutral molecules can also be transported across a membrane with the aid of the electric field, which helps move both charged and uncharged drugs into tissues [52].
3. Electro-permeabilization: This mechanism modifies the membrane's permeability by increasing the size and charge of the membrane pores, allowing for more effective drug penetration[53].

Clinical Use :

- Lignocaine and Epinephrine: Research by Thongkukiatkun et al. showed that a topical application of 20% lignocaine and 0.1% epinephrine, when combined with a 120 mA iontophoretic current for 90 seconds, is effective in anesthetizing exposed dentine [54].
- Enhanced Mucosal Accumulation: The use of lidocaine and prilocaine hydrochloride in iontophoresis has been found to significantly enhance drug accumulation in mucosal tissues [55].

Advantages:

- **Non-invasive:** Iontophoresis offers a non-needle, non-invasive method of achieving local anesthesia, which can significantly improve patient comfort and reduce dental anxiety [56].
- **Increased Efficiency:** The technique enhances the delivery of drugs, providing quicker onset and longer-lasting anesthesia, which is particularly useful for dental procedures involving sensitive areas or those requiring sustained anesthesia [57].



CRYOTHERAPY IN DENTISTRY

Cryotherapy, or cold therapy, has been proven effective in reducing pain, inflammation, and muscle spasms by applying low temperatures. It works through several mechanisms, including vasoconstriction, slower neural pain signal propagation, and reduced metabolic activity, which can alleviate pain and promote healing. Although cryotherapy is commonly used in various medical fields, it is also being increasingly utilized in dentistry, particularly for managing pain and discomfort.

Mechanism of Action :

1. **Vasoconstriction:** Cold temperatures cause blood vessels to constrict, reducing blood flow to the affected area. This helps to decrease swelling and inflammation, as well as limit the spread of pain-causing chemicals [58].
2. **Nerve Conduction:** Cryotherapy slows the conduction of nerve impulses, reducing the ability of nerves to transmit pain signals. This

makes it particularly useful for alleviating discomfort during and after dental procedures [59].

3. Pain Mediation: Cryotherapy reduces the release of chemical pain mediators, such as bradykinin and histamine, further contributing to its analgesic effect [60].

4. Metabolism Reduction: Cryotherapy lowers tissue metabolism, which improves oxygenation in the affected tissues and can speed up recovery by reducing cellular damage [61].

Benefits:

- Immediate Analgesia: Unlike other topical anesthetics that primarily target nerve cells, cryotherapy affects all cells in the treated area, producing faster and more comprehensive anesthesia [62].
- Psychological Relief: The application of cold can serve as a distraction, helping patients focus on the sensation of cold rather than pain, which provides psychological comfort during procedures [63].
- Non-invasive: Cryotherapy provides pain relief without the need for injections, making it an appealing option for patients with needle anxiety or those seeking less invasive methods of pain management [64].

Applications in Dentistry :

1. Postoperative Pain Management: Cryotherapy can be used after dental surgeries (such as extractions or implant placements) to reduce pain, edema (swelling), and recovery time. Ice packs or refrigerant sprays are applied to the area to alleviate discomfort and promote healing [65].

2. Pre-injection Anesthesia: Cryotherapy can be used before administering local anesthetics to reduce the pain associated with the injection. By applying ice or refrigerants to the injection site, the cold sensation may numb the area, making the injection less painful for the patient [66].

3. Trauma and Injuries: It can also be helpful in managing pain from traumatic dental injuries, such as sprains, fractures, and bruises, by reducing inflammation and providing immediate relief [67].

4. Managing Inflammation and Swelling: Cryotherapy can help control inflammation and swelling after procedures such as periodontal treatments or root planning [68].

Research and Efficacy:

- Studies have shown that cryoanesthesia can reduce the perception of pain from anesthetic injections by promoting myelinated A-fibers and inhibitory pain pathways, which increase the pain threshold [69].
- Cryotherapy can also be used as an adjunct to local anesthetics, enhancing the overall pain management experience, especially in procedures where local anesthetics may not be sufficient on their own [70].
- Gate Control Theory of Pain: This theory suggests that the brain can only process one sensation at a time. When cold is applied, it "blocks" the pain signal, allowing the brain to focus on the sensation of cold, thus reducing the perception of pain [71].

Limitations:

- Temporary Effect: Cryoanesthesia is a short-term solution, and its effects wear off relatively quickly. However, its immediate relief is often sufficient to make injections or minor procedures more comfortable [72].
- Risk of Tissue Damage: Prolonged or excessive exposure to cold can lead to tissue damage or frostbite. It is important to apply cryotherapy for appropriate durations to avoid adverse effects [73].

BUZZY® DEVICE

The Buzzy® device (MMJ Labs, Atlanta, GE, USA) is a non-invasive, quick, and reusable pain-relief tool designed to minimize the discomfort associated with needle-related procedures in

children. It was developed by a pediatrician and a nurse seeking an effective solution to reduce pain and anxiety for young patients undergoing injections, such as dental treatments.

Device Design and Components:

- **Shaped Like a Bee:** The device features a bee-shaped body, which houses the vibrating motor, and detachable ice wings that provide cold therapy.
- **Vibration Mechanism:** The bee's body contains a motor powered by two AAA alkaline batteries. The vibration is activated via a switch on the top of the device.
- **Ice Wings:** The detachable ice wings (weighing 18 g each) can be stored in the freezer between uses and are designed to remain frozen for about 10 minutes at room temperature. Each pair of wings can be used up to 100 times.

Mechanism of Action:

The Buzzy® device uses a combination of cold therapy and vibration therapy, both of which are based on the Gate Control Theory of Pain:

- **Cold Therapy:** The ice wings excite C fibers in the skin, which are responsible for transmitting cold sensations. The cold reduces the transmission of pain signals from the needle insertion site.
- **Vibration Therapy:** The vibrating motor stimulates A-beta fibers, which are responsible for transmitting touch sensations. These fibers have a higher priority in the nervous system than the pain signals from A-delta fibers, effectively blocking pain perception.

This dual stimulation of cold and vibration helps in blocking pain signals from reaching the brain, thus reducing the pain sensation.

Application and Usage:

1. Pre-Procedure Setup:
    - o The ice wings are removed from the freezer and attached to the body of the device using elastic bands.
    - o The Buzzy® device is positioned approximately 5 cm above the needle insertion site on the patient's arm or other relevant area.
    - o The vibration is activated and maintained for 30 to 60 seconds before and during the procedure.
2. During the Procedure:
    - o The device is either held manually or strapped to the patient's arm near the needle insertion site.
    - o The vibration and cold therapy are maintained throughout the needle-related procedure to reduce pain and anxiety.

Clinical Efficacy and Benefits:

- Reduced Pain and Anxiety: Studies, such as those by Bilsin et al., have shown that children undergoing dental extractions experienced significantly lower pain and anxiety levels when treated with the Buzzy® device compared to traditional methods like vapocoolants and analgesic creams[74].
- Comparison to Other Devices: Research by Faghihian et al. suggests that the Buzzy® device is more effective than similar tools like DentalVibe in reducing pain during dental injections [75].
- Age Range: The device has been found to be especially effective in children between the ages of 4 and 11 years, providing relief during dental procedures such as local anesthesia injections, extractions, and pulpectomies [76].

ACUPRESSURE FOR TOOTHACHE RELIEF

Acupressure, derived from traditional Chinese medicine, involves applying pressure to specific points on the body called acupoints to relieve pain and promote healing. The underlying theory is that energy, or qi, flows through meridians in the body, and when these meridians are blocked, it can lead to pain and discomfort. By applying pressure to specific acupoints, acupressure aims to restore the flow of qi and reduce pain.

While acupuncture uses needles to stimulate acupoints, acupressure is a non-invasive alternative that uses manual pressure, typically applied with the fingers or hands. According to the World Health Organization (WHO), acupressure and acupuncture are recognized as effective treatments for dental pain.

Mechanism of Acupressure in Toothache Relief

Acupressure for toothaches is believed to work in several ways:

- Changing the way, the brain perceives pain: Acupressure may influence the central nervous system to reduce pain sensitivity.
- Reducing physiological responses: Acupressure can lower heart rate, blood pressure, and levels of epinephrine, which are often elevated during pain.
- Increasing the release of endorphins: These natural pain-relieving chemicals in the body raise the pain threshold.
- Reducing inflammation: By stimulating acupoints, acupressure may increase the release of anti-inflammatory cytokines that help to reduce swelling and inflammation.
- Improving blood circulation: Enhanced circulation can help reduce swelling and promote healing in the affected area.

How to Perform Acupressure for Toothache

To perform acupressure effectively, follow these general steps:

1. Find a Comfortable Position: Sit or lie in a relaxed position. Close your eyes and take deep, slow breaths to help calm your body.
2. Apply Firm Pressure: Use your fingers to apply firm, but gentle pressure to the acupoints. You can massage each point in a circular or up-and-down motion.
3. Duration: Massage each point for several minutes or until you feel relief from the pain. If necessary, repeat the process several times.

Effective Acupressure Points for Toothache Relief

Here are some key acupoints that can help alleviate toothache and related symptoms:

1. **SI18: Quanliao (Small Intestine Meridian)**
   - Location: Under the cheekbone, just below the outer corner of the eye.
   - Effect: Pressing this point may relieve sinus congestion and toothaches, especially in the upper jaw.
2. **ST6: Jiache (Stomach Meridian)**
   - Location: Midway between the bottom of the earlobe and the corner of the mouth. Clench your jaw and feel the muscles to locate this point.
   - Effect: Pressure here may reduce jaw pain, spasms, and toothache, and can also help with swelling.
3. **LI4: He Gu (Large Intestine Meridian)**
   - Location: In the webbing between the thumb and index finger.
   - Effect: This is a common point for relieving facial pain, headaches, and toothaches. It may also help with inflammation and congestion.
   - Note: This point should be avoided during pregnancy, as it may induce labor in some cases.
4. **GB21: Jianjing (Gallbladder Meridian)**
   - Location: Between the tips of the shoulders

and the neck, on the shoulder muscle.

- Effect: Pressing this point can relieve jaw pain, tension, and toothaches. Be cautious during pregnancy, as this acupoint may trigger labor in some cases [77].

VIRTUAL REALITY ANESTHESIA

Virtual Reality (VR) is emerging as an innovative method for pain management in medical and dental procedures, particularly for children [78]. By immersing patients in a 3D, computer-generated environment, VR serves as a form of distraction therapy—engaging the brain and diverting attention away from pain [79]. This method is based on the theory that the brain, overwhelmed by the sensory input from the virtual world, reduces its focus on pain signals[80].

Mechanism The immersive experience offered by VR can be highly engaging, providing patients with the sensation of being "present" in a completely different environment [81]. The key mechanism behind VR analgesia is the concept of sensory overload [82]. As the brain is occupied with processing the virtual world, it has fewer resources to focus on and process pain signals from the body [83]. The patient experiences a distraction that alters their perception of discomfort and, in some cases, reduces pain entirely [84].

Application in Dentistry In the context of pediatric dentistry, VR has shown promise as a way to reduce the anxiety and discomfort children experience during dental procedures such as local anesthesia administration, periodontal scaling, and root planning [85]. Studies have demonstrated that VR can be especially effective for reducing pain perception in both adults and children undergoing dental procedures[86].

For example, children who underwent local anesthesia reported significant reductions in worst pain and pain discomfort when VR distraction was used compared to standard methods or watching movies [87]. Pediatric dental patients also showed lower pain scores and decreased anxiety levels when VR was employed during dental injections [88].

Research Findings

1. Pain Reduction: Multiple studies have shown that VR distraction significantly lowers pain perception, including pain related to local anesthesia, dental injections, and dental procedures such as extractions [89].
2. Anxiety Reduction: VR distraction not only alleviates pain but also reduces anxiety. Research indicates that VR helps lower state anxiety in pediatric and adult patients undergoing dental treatments [90].
3. Effectiveness: Studies show that VR distraction can result in lower reports of pain, especially when compared to traditional pain management techniques. VR has been shown to be more effective than standard care in reducing both worst pain and pain discomfort during dental procedures [91].
4. Immersion and Engagement: The use of highly immersive VR systems such as the Oculus Rift is gaining attention, although its effectiveness in pediatric dental settings is still being explored [92].

Adverse Reactions While VR distraction has shown promise, some adverse effects have been noted:

- **Mild nausea:** A small proportion of participants (5 out of 38) reported mild nausea during the use of VR, though this was significantly less common than in other forms of distraction like movie-watching [93].
- **Discomfort:** A few pediatric patients (about 5%) were uncomfortable with the VR experience, and the device had to be removed. However, these reactions were rare, with a high percentage (over 90%) of patients reporting no discomfort [94].

CONCLUSION

Pain management remains a top priority for many practicing dentists, with a significant focus on minimizing discomfort during procedures, particularly for children. The fear of pain associated with needles and syringes is a common

concern among patients. The techniques discussed—ranging from CCLAD systems to vibrotactile devices, jet injectors, and intraosseous systems—offer effective solutions for reducing pain and improving patient comfort during dental procedures. These methods not only help in managing pain but also contribute to fostering positive attitudes toward dental care, especially for pediatric patients.

Although some techniques may require significant investment in terms of time and resources, they have proven to be reliable tools in making dental visits more comfortable and pleasant. These newer methods, while advancing patient care, complement older techniques that some practitioners may still prefer due to familiarity or cost considerations. However, as advancements in dental technology continue, these newer approaches are likely to contribute to more efficient, comfortable, and effective dental treatments with improved patient satisfaction.

For example, CCLAD systems offer controlled delivery of anesthetic, reducing pain during injection, while vibrotactile devices aid in alleviating discomfort through vibration. Intraosseous systems provide deep anesthesia without the need for traditional injections, and safety syringes help minimize the risks associated with needle-stick injuries.

In conclusion, the dental profession is evolving with the introduction of advanced local anesthetic delivery systems. To provide the best care, it is essential for dentists to stay well-informed and skilled in the latest technologies. By selecting the appropriate techniques based on patient needs, dental professionals can ensure reduced pain, lower stress for both patients and clinicians, and ultimately improve patient compliance with dental treatments. These innovations not only enhance patient experience but also contribute to higher levels of comfort, satisfaction, and trust in dental care.

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Augmented Reality and Virtual Reality as part of regular dental education: A Critical Review

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ABSTRACT:

Dental education is experiencing a paradigm shift with the integration of advanced technologies such as Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), and Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM). These innovations are transforming traditional pedagogical approaches, offering immersive, efficient, and accessible learning environments that address the growing complexity of clinical procedures and the rising demand for skilled dental professionals.

VR allows students to engage in realistic, interactive simulations of dental procedures, fostering the development of psychomotor skills and clinical decision-making within a safe and repeatable setting. AR enriches real-world learning experiences by overlaying digital content, thereby enhancing both on-site and remote education with dynamic, context-aware insights. Meanwhile, CAD/CAM technologies are revolutionizing prosthodontics and restorative dentistry through streamlined digital workflows—from design to fabrication—improving precision, reducing chairside time, and optimizing patient outcomes.

This article examines the evolving role of these technologies in dental education, exploring their pedagogical benefits, practical applications, and implementation challenges. It emphasizes how VR, AR, and CAD/CAM support self-directed, reflective learning, promote academic excellence, and potentially reduce training costs. Embracing these advancements equips institutions to better prepare future dental practitioners for contemporary clinical demands. Ultimately, the convergence of technology and education heralds a new era in dental training—one that promises to elevate standards, foster competence, and build confidence among the next generation of oral health professionals.

INTRODUCTION

Dental practice and education is by far one among the most complex and demanding. In today's world of fast evolving technologies and stringent regulations, it is only getting harder by the day. “In order to meet the inevitable increase in demand for training, teaching and learning, innovative approaches will be required and dental academia will be asked to respond.” Quoted British Dental Journal, in a two decade old article which still stands relevant.[1]

Use of technology and other improvisations in delivery of education across all fields has seen a sea change over the past decade, moving from conventional textbooks, lectures and hands-on to e-learning and m-learnings, to today’s gamification, virtual reality and augmented reality. This empowering both teachers and learners in a great way.

Dentistry training is not new to the use of simulation with plastic models, however with the use of computer based technologies such as CAD/CAM, Augmented Reality, Virtual Reality, 3D Printing in dental education has many benefits including:[2-4]

- Reduced risk
- Realistic recreations
- Remote training on complex cases
- Improves knowledge retention and recall
- Innovative and enjoyable
- Easy to repeat and relearn

These technologies are likely to change clinical training and encourage the use of reflective forms of assessment, which involve students in a self-assessment process to identify individual learning

needs and self-directed learning. These innovations promise not only lower costs of the educational process, but also an increase in quality by providing a new set of pedagogical tools for dental schools.[5]

In this article we have reviewed multiple futuristic technologies and their application in dental education.

Virtual Reality

What is Virtual Reality?

Virtual Reality (VR) is commonly defined as "A technology that convinces the participant that he or she is actually in another place by substituting the primary sensory input with data received produced by a computer".3 Also, in the recent past, VIn recent years, virtual reality (VR is gaining popularity) has become popular in clinical research studies as an 'innovative distractor' technique, considering it is . It is a non-invasive simulation technology whichthat allows a user to interact with a computer- generated environment, in the three dimensions. (3D) of width, height, and depth.[6]

Types and Features of Virtual Reality

In clinical care, VR Virtual reality has often been used in conjunction with other distraction interventions which is a promising non-pharmacological approach for pain management in patients suffering pain.[6]

The interactivity of VR is made possible by a head tracking system attached to the Head Mounted Device (HMD) that tracks the user's head movements, and permits the user to feel engaged in the virtual environment, providing a sense of presence that is the feeling of being in VR environment as it was a real environment. In dentistry, exquisite hand skills are essential for daily treatments, and while virtual models of various cavity preparations are being developed to help students visualize different tooth structures and subtle variations, dental students still have limited opportunities to treat patients during clinical training.5-7In dentistry the exquisite hand skill is required for daily treatments.6 Virtual models of different cavity preparations are being developed to help students to visualize differing tooth structures and subtle differences in cavity preparations.7 However, dental students have little chance to treat patients in the clinical training.[5] Virtual Reality is mainly classified into three types, non-immersive, semi-immersive and immersive.

Non-immersive is the one where a user's interactivity with the virtual environment is limited via a keyboard or mouse, these are screen based and . It provides a lesser degree of immersion to the user.[5]

Semi-immersive VR is where the users are provided with partial immersion experience, immersed in a large screen or environment, while being still connected to the physical surroundings. Immersive VR uses Head Mounted Devices (HMDs), Haptic sensors and environments are recreated in a 3 dimensional (3D) view, thereby providing increased interactivity and a complete immersive experience to the user.[5,7]

There is strong (Level 1a) evidence suggesting that immersive VR is a promising tool for acute pain management. decreasing pain in adults undergoing acute pain. A limited level of evidence of 2a indicates that immersive VR may be effective compared to no therapy or conventional therapy for pain relief in adults with chronic pain and children with acute pain.[6]

Main disadvantage of the system is limited accuracy of the occlusal surface. This is because it acts as simple mechanical occludators and cannot take into consideration the functional movements of the mandible.[8]

Virtual Reality in Dental Education

3D Dental Patient: This 3D model enables dental students to learn about the anatomy of the teeth and mouth. Along with an additional functionality of a haptic input device or 'Phantom' controller which controls a virtual drill. This helps students to get familiar with teeth anatomy, equips them with skills, impart knowledge and confidence.[4]

Virtual Reality Dental Chair or 'HapTEL' (haptics technology enhanced learning): is designed to teach a range of dental techniques to students and dental professionals. This system consists of a dentist's chair; a mirror and a haptics based drill which enables the trainee dentist to perform various procedures. The trainee can actually 'feel' the pressure of the virtual drill which is due to a process called force feedback. This is a system of physical responses (feedback) caused by movements of an input device (e.g. joystick) which are experienced by the user. But what the feedback does is to provide a sense of realism which replicates what they would experience during a real world procedure. This enables them to develop fine motor control, e.g. control the speed of a drill which is vital during a dental procedure.[4]

VirDenT system: The VirDenT system conducted by the research team from the Faculty of Mathematics and

Informatics of the Ovidius University of allows the reductional preparation of the teeth: upper right central incisor (11), left first upper premolar (24), left lower canine (33) and first lower molar right (46), representing one on each and every group of the dental hemiarch.[4,8,9]

Voxel-man dental: VOXEL-MAN Dental is a new kind of dental simulator, based on virtual reality technology. Students are working on simulated patient cases with a look and feel close to a real procedure, training both their manual dexterity and problem solving skills. With its striking new features, VOXEL-MAN Dental greatly improves quality and cost-effectiveness in pre-clinical training—and beyond.[4,9,10]

What is Augmented Reality?

Prototypes, physical models, and detailed illustrations and posters are all extremely expensive. More often, schools do not have enough money to buy all the supplementary learning materials they would like. Further, these learning materials get worn down, lose their relevance, and get misplaced over time.With Augment, there is no requirement to invest in physical materials. Students can access models from any device at any time. [10]

Augmented reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. It has been used in the educational process in medicine. This technology supplements the real world with virtual objects that are generated digitally so that they appear to coexist in real space.[11]

Types & Features of Augmented Reality

Augmented reality is useful because it can enhance the user's perception and interaction with the real world. AR is a concrete example of intelligence amplification involving the use of computers as tools to facilitate tasks performed by a human. AR combines virtual and real information in the same environment; this way, the student becomes proximal to the content, facilitating the distance-learning educational process without the user losing perception of the real environment.[12]

Augmented reality refers to superimposition of computer-generated graphics over a real- world scene. In contrast to VR simulators, in AR the real environment is not completely suppressed and in fact plays a dominant role in this process. [13]

Augmented Reality in Dental Education

Before surgery, the surgeon would be able to map the surgical plan on the 3D image of the site and consider any necessary modifications. During surgery, the surgeon sees and follows the mapped image overlaid on the surgical site by use of special glasses. One of the main uses of AR in oral and maxillofacial surgery is in visualization of deep masked structures and this system can be developed for root canal therapy as well.[12]

The AR's development methodology was designed to promote greater teacher autonomy. The use of a 3D scanner facilitated the virtual modeling process, reducing the graphic designer's work time. The designer's work was guided by a large number of references: macro-models, dental atlases, dental instruments, and illustrations.[12]

The AR process collects 3D information from a patient in real time by using non invasive procedures such as computed tomography and ultrasound. These data sets are then combined, processed, and projected in a real patient, giving the professional an anatomical view of the patient's structures. This can reduce surgical trauma. [12]

The comparison between virtual reality and augmented reality is detailed in Table 1.

Table 1: Comparison of virtual reality and augmented reality

Concept	Classification	Fully synthetic virtual world	Fully real virtual world	Absolute spatial registration critical	Relative spatial registration critical	Real-Time interactivity critical
Augmented reality	Uses computer	No	No	Maybe	Yes	Yes
Virtual reality	Uses computer	Yes	No	No	Yes	Yes

Current uses of Augmented in dentistry

AR Apps

Henry Schein Dental's first interactive Equipment & Technology Catalogue using augmented reality technology was released in 2014, and it literally changes the way doctors and their teams view dental products and services. Henry Schein Xtra app is an easy to use mobile application, one has to just open the catalogue and turn to a page that contains the AR icon and hover over the page with your device. The app will "scan" the page to find the augmented reality features,and launches related learning video.[13]

iDENT (Wearable AR in clinical practice)

The best use of AR is still in its nascent stages, i.e., the wearable AR, google glass, meta, Epson moverio and the latest Microsoft HoloLens all of them seem very promising to assist healthcare professionals. However, no significant success is noted still.13 One of the mentionable applications of wearable AR in dentistry was demonstrated during theCEREC 30 event in September 2015. EyeCAD-connect developed by iDENT in association with Epson, using the Moverio BT 200 glasses was demonstrated and received a lot of accolades during the event. This system eliminates head turning by using the Moverio BT-200 platform as the playback device. Thanks to this heads-up display, the dentist is always looking at the patient and sees the image from the camera as a layer over their view of the patient's teeth. This enables better hand-eye coordination and a more precise treatment time.[14]

What is CAD/CAM?

Computer-based technologies play an important role in all aspects of our daily life as well as in dentistry. Simplified interactions between human and computer have caused a profound progress in virtual reality (VR)-based dental training. Computer-aided design/computer aided manufacturing (CAD/CAM) of dental appliances and prostheses is now widely used around the globe. 13

Application of CAD/CAM in Dental Education

The evolution of dental materials and advances in computer science led to a rapid development in dental CAD/CAM technology. During the past couple of decades, many advanced chairside and laboratory CAD/CAM systems were introduced. Computers are used to collect data and design and manufacture a wide range of products in CAD/CAM systems. These systems have long been used in industries but they were not available for dental applications until the 1980s.12

The term CAD/CAM in dentistry is equal to manufacturing by milling technology. However, it is not completely true, because manufacturing can either be by subtractive (milling) or additive technologies.

The CAD/CAM systems consist of three components:

1- A digitization tool/scanner that transforms geometry of a real world object into digital data to enable processing by a computer.

2- Software for data processing.

3- A technology, which manufactures the desired product from the digitized data set

The main benefit of this type of manufacturing in dentistry is that conventional impressions are not needed anymore, which is believed to save the dentist's chair time and eliminate a time- consuming step.[12]

The CAD/CAM technology is used in orthodontic diagnosis, treatment planning and fabrication of appliances (Invisalign Production Process) which include submitting of the scan or impressions and photographs to the company with the doctor's instructions.[13]

Some of the advantages and disadvantages of CAD/CAM system are the following :-

Advantages of CAD/CAM systems	Limitations of CAD/CAM systems
No need for traditional impressions when intra- oral scanners are used	High cost
Chairside fabrication of restorations	Need mastering of technology
Fewer visits	Manual veneering is used most of the time
Needs less manual procedures in laboratory	
Needs less laboratory time	
Easier laboratory procedures	
Good marginal accuracy	
Suitable for materials like zirconia	

Table 2: Comparison of technologies in Dental Education

Virtual reality	Augmented reality		CAD/CAM systems
Prosthodontics	Diagnosis and treatment planning for implant placement		Fabrication of crown and bridge frameworks
Fabrication of custom made abutments for implants			
Designing and manufacturing of implant surgical splints			
Designing and manufacturing RPD metal frameworks			
Designing complete dentures			
Virtual articulator which used in many diagnostic and therapeutic procedures			
Maxillofacial Surgery	Training by performing virtual surgery	Superimposition of radiographs over the surgical site	Making maxillofacial prosthesis
3D observation of surgical site		Implant placement during surgery	
Orthodontics		Diagnosis and treatment planning	
Determining the position of impacted maxillary canines			
Periodontics	Training of scaling		Diagnosis and treatment of periodontal diseases
Differentiating between pathological and normal conditions			
Restorative Dentistry	Training tooth preparation		Fabricating indirect restorations

Conclusion

Virtual reality & Augmented reality provides a lot of promise into the future of dental education. Virtual reality can seamlessly replace the current usage of plastic or moulded models to the use of virtual animated models. Also, simulation haptic devices can help in improvising skills with zero risk on patients.17.18.19

Augmented reality, in the future might just become part of everyday practice of dental surgeons.These technologies with the innovations, are showing a lot of promise, however, to bring them to practice, it would necessitate a close collaboration and detailed usability analysis by dental surgeons and technologists.4,19

With the advent of the digital impression and dental CAD/CAM system, today's dentistry has become dentistry of single visit. Patients can receive crowns in a single appointment. But even the latest CAD/CAM system has its own limitations. Computers are used to collect data and design and manufacture a wide range of products in CAD/CAM systems. The main benefit of this type of manufacturing in dentistry is that conventional impressions are not needed anymore, which is believed to save the dentist's chair time and eliminate a time-consuming step.

Rapid prototyping results in fabrication technologies such as 3DP and are extensively used in treatment of maxillofacial defects and surgeries and also for designing and manufacturing removable partial denture metal frameworks using this method.

Digital tools for education, when properly used, allow for the incorporation of 3D visual im- ages, thereby increasing the educational potential through "multimodality." These new, multimodal tools complement the idea that each student learns differently because they can relate to each student's learning style preferences and needs.

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Exploring orthodontists' perspectives on conventional and self-ligating Brackets: A Questionnaire study

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ABSTRACT

Objective:

This study aimed to evaluate orthodontists' perceptions of self-ligating (SL) versus conventional brackets in orthodontic treatment, focusing on treatment efficiency, patient comfort, and overall clinical outcomes.

Methods:

A cross-sectional survey was conducted with 70 practicing orthodontists in India. The online questionnaire containing 13 questions was sent out from September to October 2024. The survey evaluated several areas of treatment, such as the desired bracket system, treatment duration, patient discomfort, precision of bracket placement, and the effectiveness of treatment.

Results:

A survey of 70 orthodontists found that self-ligating (SL) brackets reduced patient discomfort, improved cooperation, and shortened treatment times. Both Self-ligating brackets and conventional brackets were equally effective in achieving tooth movement. Self-ligating brackets were associated with less chairside time and better support for oral hygiene. No differences were observed in treatment effectiveness or long-term stability between the two systems. Self-ligating brackets offer greater efficiency and comfort compared to conventional brackets.

Conclusion:

SL brackets have tremendous benefits in terms of patient comfort, efficiency in treatment, and decreased chair time, but traditional brackets are favored for more control-intensive cases. The decision to use SL or traditional brackets should be individualized according to clinical indications and patient considerations. Additional studies are required to establish long-term advantages and clinical superiority of SL brackets in different orthodontic situations.

INTRODUCTION :

Self-ligating (SL) brackets were initially introduced early in the 20th century but did not receive much attention until recent times, when there were major improvements in their design and many benefits proposed, which increased their popularity among orthodontists[1].Self-ligating brackets differ from traditional brackets in that they have an integrated mechanism that holds the archwire without the use of traditional elastic or wire ligatures[2]. This innovation is credited to decrease friction, hopefully increasing tooth movement and shortening treatment time[3]. Self-ligating bracket proponents list various benefits, such as accelerated space closure, better arch expansion with less incisor proclination, and greater patient comfort because of lighter, more continuous forces[1].

Despite the increased interest in Self-ligating brackets, various studies have questioned the clinical effectiveness of these benefits. Although Self-ligating brackets have been commonly said to cause reduced

friction as opposed to traditional brackets under perfect circumstances, clinical conditions which include malocclusion or tipping of the teeth do not always exhibit enormous differences4. Furthermore, the reduction in friction is even more apparent with thin archwires, and when thicker wires are added, the advantages are no longer clear. Thus, it is still controversial for the hypothesis to state that SL brackets consistently provide accelerated treatment or better clinical results[5].

Treatment efficiency is also one of the primary areas where Self-ligating brackets are believed to outshine. There are studies that indicate Self-ligating systems have the ability to cut down on treatment time and appointment frequency1. But these results are not universally accepted. For example, one study concluded there was no considerable difference in treatment time between Self-ligating and conventional systems when comparing total alignment and space closure rates4. Also, evidence on the advantage of Self ligating brackets over the control of torque and aligning of teeth, especially during later treatment phases, is mixed[2].

Along with these clinical factors, Self-ligating brackets have frequently been linked with better oral health since there are no ligatures, where the plaque can accumulate[2], thus resulting in less bacterial retention and plaque accumulation on Self-ligating brackets1, other studies have identified no significant differences in oral health results between Self-ligating and conventional systems[2]. This emphasizes the necessity for further research to establish whether the claimed oral hygiene advantages of Self-ligating brackets are clinically significant in the long term. In spite of these doubts, the general popularity of Self-ligating systems in clinical practice indicates that, for most orthodontists, the perceived advantages outweigh the limitations and that it is necessary to further assess their effectiveness in varied clinical environments[3].

OBJECTIVES

To assess and compare the significant clinical differences between self-ligating and conventional brackets during orthodontic treatment, as perceived by orthodontists.

MATERIALS AND METHODS

- The study was conducted as a cross-sectional survey to assess the views of orthodontists about self-ligating (SL) brackets compared to conventional brackets.
- The survey consisted of 70 practicing orthodontists in India.
- The survey was done online with Google Forms. Participants, such as orthodontic postgraduates and members of the Indian Orthodontic Society who are practitioners/clinicians, received a link to the survey. The study lasted for one month, from September 2024 to October 2024.
- The questionnaire consisted of 13 items that focused on the orthodontists' experiences with and views on the claimed advantages of SL brackets. These included topics such as reduced friction, faster treatment times, and improved patient comfort. The questions were designed to assess both the practical experiences and theoretical knowledge of orthodontists regarding SL brackets and their comparison with conventional brackets.

Inclusion Criteria: Orthodontic postgraduates, orthodontic academicians, and orthodontic practitioners/clinicians who are members of the Indian Orthodontic Society were included in the study.

Exclusion Criteria: General dentists and other specialty dental professionals were excluded from the study.

The data collected through the survey were analyzed to identify trends and variations in responses based on factors such as clinical experience and bracket preference. The results were used to understand the general perceptions of Indian orthodontists regarding the benefits and challenges of using self-ligating brackets in clinical practice.

Statistical Analysis

- Descriptive statistics were executed with the aid of the Statistical Package for Social Sciences (SPSS) for Windows, version 26.0 (IBM Corp.).
- Throughout the analysis of survey results, we chose to analyze answers with most responses.
- In the descriptive analysis, the majority of responses were expressed as percentages (%) alongside the corresponding number of respondents (n).

RESULTS

A total of 70 respondents participated in the survey.

Questions	Responses (%)	Respondents answers
How long have you been using self-ligating brackets in your practice?	28 (40%)	1 – 3 years
What is your preferred type of bracket for most orthodontic treatments?	36 (51%)	Prefer either self-ligating brackets or conventional depending on the case for most of the orthodontic treatment
In your experience, has the use of self-ligating brackets helped reduce patient discomfort and improve cooperation during treatment?	69 (98.6%)	Reported reduced **patient discomfort** and improved **cooperation** with self-ligating brackets.
What are the typical appointment intervals for conventional bracket system?	51 (72.9%)	Reported typical **appointment intervals** for conventional brackets is 4 to 5 weeks.
What are the wire combinations commonly preferred to facilitate dental expansion in self -ligating bracket system?	46 (65.7%)	Preferred CuNiTi for dental expansion in self- ligating system
Under what circumstances is a self-ligating bracket system recommended for orthodontic treatment?	36 (51.4%)	orthodontists prefer selfligating system in both extraction and non-extraction cases
How would you rate the effectiveness of the self -ligating brackets compared to conventional brackets system in achieving tooth movement?	36 (51.4%)	Preferred SLB and conventional brackets are equally effective in achieving tooth movement
In your opinion, how does the overall treatment time compare between conventional a nd self -ligating bracket systems?	53 (75.7%)	preferred self-ligating brackets for **shorter over all treatment time.**
Has the use of self -ligating bracket system reduced the chairside time for patients?	66 (94.3%)	reduced **chairside time** with self-ligating brackets
Which bracket system, conventional or self -ligating, do you find to be more effective for precise bracket positioning?	29 (41.4%)	preferred selfligating system to be more effective for precise bracket positioning
Which bracket system do you find more comfortable for patients?	59 (84.3%)	self-ligating brackets **more comfortable** for patients.
In your experience, do self-ligating brackets result in better	30 (42.9%)	Preferred self-ligating system and conventional

The survey results indicate a pronounced preference for self-ligating brackets among orthodontists, primarily due to their capacity to reduce patient discomfort and enhance cooperation during treatment, as reported by 98.6% of respondents.

Self-ligating brackets are also preferred because they minimize chairside time and facilitate oral hygiene, according to 94.3% and 88.6% of the respondents, respectively.

Whereas 51.4% of the participants equally rated self-ligating and conventional brackets as effective in producing tooth movement, 75.7% favored self-ligating brackets for reduced overall treatment time. Nevertheless, conventional brackets are still favored for optimal control in intricate cases. The results indicate that self-ligating brackets are highly beneficial regarding patient comfort and efficiency of treatment, though their efficacy in producing tooth movement and long-term stability is on par with conventional brackets.

DISCUSSION

- Pellegrini et al investigated the influence of method of archwire ligation on plaque retention using ATP-driven bioluminescence to assess bacterial load. Mean streptococcal and total bacterial levels harvested from tooth surfaces were lower with the SLB6.
- Passive self-ligating appliances feature a built-in mechanism that automatically holds the wire, without the undesirable force relaxation of elastomeric modules, thereby maintaining a constantly active status of engaged wires. This makes them suitable alternatives to conventional appliances[7].
- According to yamaguchi et al the GCF levels of substance P were significantly lower in the self-ligating system compared to conventional brackets; therefore, self-ligating brackets may be a useful system for reducing inflammation[8].
- Frictional resistance (conventional bracket system) in orthodontics dissipates up to 60% of applied force, reducing tooth movement efficiency. Self-ligating brackets, with built-in clips or slides, eliminate ligatures, reducing friction and enabling faster tooth movement, thus decreasing treatment time[9].
- The results showed a split preference for SL and conventional brackets, with a slight tendency towards conventional systems for most cases. This is in line with existing studies suggesting that although SL brackets offer benefits in specific contexts, conventional brackets remain the go-to option for a significant portion of orthodontists due to their predictability and ease of use, especially in complex cases. The preference for conventional brackets may stem from their more well-established efficacy in managing complex malocclusions and their higher degree of control over tooth movements, which is essential for certain orthodontic objectives[10].
- The results of this study align with the findings from previous research, particularly with regard to the efficiency and advantages of self-ligating (SL) brackets compared to conventional ligating

brackets. A notable observation from the study was that during archwire changes, self-ligating brackets were 2.76 times quicker than conventional ligating brackets. This result supports the notion that self-ligating brackets can significantly reduce chair time, which is one of the most frequently cited benefits of their use in orthodontic treatment[11].

- The time-saving aspect of self-ligating brackets is often attributed to their unique design, which eliminates the need for traditional elastic or steel ligatures. The smart clip mechanism, which automatically secures the archwire, facilitates smoother and faster adjustments during archwire changes. These findings are consistent with the experiences of orthodontists surveyed in this study, where a majority expressed satisfaction with the reduction in treatment time when using SL brackets. The perceived advantage in terms of time efficiency directly translates to a more streamlined workflow in clinical practice, potentially leading to an increase in the number of patients treated or a reduction in the overall duration of the treatment process[12].
- In the SL bracket system, orthodontists commonly employ lighter, round wires initially to facilitate dental expansion. These wires are preferred because they reduce friction, which is a crucial factor in the early stages of treatment. As treatment progresses, practitioners transition to heavier, rectangular wires to refine tooth movement and establish the final occlusion. The use of light wires during the early stages of treatment allows for more controlled and efficient alignment, as reduced friction improves the rate of tooth movement, particularly in the initial alignment phase[13].
- Most orthodontists in the study reported that both SL and conventional brackets are effective in achieving tooth movement, but the degree of effectiveness depends on the specific treatment goals. SL brackets were perceived as particularly beneficial in the initial stages of treatment due to their ability to facilitate faster tooth movement and reduce friction[14]. However, when it comes to precise control of tooth movement, especially in cases requiring torque or in patients with severe malocclusions, conventional brackets were often rated as more effective due to their superior mechanical control[15].
- Conventional brackets were generally regarded as more effective for precise bracket positioning. Many orthodontists noted that the self-ligating system, with its rigid clip mechanism, may offer less tactile feedback during placement, making it more challenging to achieve precise bracket positioning in certain cases. This finding is in line with literature that suggests conventional brackets, with their flexible ligature ties, provide more adjustability during the bonding process, ensuring more accurate positioning[16].
- SL brackets were generally found to be more comfortable for patients, primarily due to the absence of elastic ligatures that can irritate the oral mucosa. The mechanism of self-ligation in SL brackets also reduces the need for frequent adjustments, which in turn minimizes discomfort during treatment. This corresponds with findings in previous studies, where patients reported less pain and discomfort during treatment with SL brackets compared to conventional systems[16].
- The opinions regarding long-term stability were divided, with many orthodontists expressing that SL brackets do not offer a clear advantage in this regard. Several studies have shown no significant difference in long-term stability between SL and conventional brackets, suggesting that stability is more dependent on other factors, such as the post-treatment retention phase, rather than the type of bracket used[15].
- SL brackets were generally considered more supportive of oral hygiene due to the absence of elastomeric ligatures, which can trap plaque and bacteria. As a result, SL systems are believed to reduce the accumulation of plaque and decrease the risk of gingival inflammation and white spot lesions16. However, some studies have failed to find significant differences between the two systems in terms of long-term oral health outcomes, suggesting that proper patient hygiene practices are critical regardless of the bracket type used.

CONCLUSION

- This study explored orthodontists' perspectives on self-ligating (SL) and conventional brackets, highlighting a growing adoption of Self-ligating brackets for their perceived benefits.
- Self-ligating brackets are preferred for reducing patient discomfort, enhancing cooperation, and potentially shortening treatment times due to lower friction and absence of elastic ligatures.
- Despite the advantages, conventional brackets are still preferred in cases requiring precise control of

tooth movement or complex malocclusions.

- Both systems showed similar effectiveness in achieving tooth movement, with no significant difference in outcomes for challenging cases.
- Long-term stability of results with Self-ligating brackets remains inconclusive and requires further investigation.
- Overall, Self-ligating brackets offer benefits in patient comfort and treatment efficiency, but conventional brackets are still preferred for specific cases requiring more precise control.
- The choice between Self-ligating and conventional brackets should be individualized based on patient needs and orthodontist experience, with further research needed to confirm Self-ligating bracket superiority in certain aspects of treatment.

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"Uncommon Presentation of Lateral Dermoid Cyst in The Floor Of The Mouth:a Rare Case Report"

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ABSTRACT

Dermoid cysts of the oral cavity are uncommon with majority of cases being reported in the midline of floor of the mouth.They are benign developmental cysts arising from the entrapped ectodermal tissue in the line of fusion.A lateral dermoid cyst is a rare lesion of the floor of mouth, with only 12 cases reported in the literature.We report the case of a 23 year old female who presented with a painless mass in the lower left side of the jaw.Intraorally no abnormalities were detected.Ultrasound findings demonstrated a cystic lesion, and definite diagnosis was made with MRI, intraoperative findings along with histopathologic confirmation. Conservative surgical excision is the treatment of choice in all cases. Clinicians should consider dermoid cysts in the differential diagnosis of soft tissue lesions in the oral cavity, mainly located on the floor of the mouth and labial mucosa.

Key words:Dermoid cyst,Ectoderm,Floor of mouth,Ultrasound

INTRODUCTION :

A dermoid cyst(DC) is a benign cutaneous developmental anomaly that arises from the entrapment of elements of ectoderm along the lines of embryonic fusion.1They are lined by stratified squamous epithelium with mature skin appendages on their wall and lumens filled with keratin and hair. Dermoid cysts are considered to be congenital, but not all cases are diagnosed at birth. About 40% of dermoid cysts are only diagnosed at birth.2 They grow slowly and may enlarge over years or decades and not become clinically apparent until late adolescence.3Most of them occur in the second to fourth decades of life. Dermoid cysts occur most commonly on the head and neck, with 84% of these cysts occurring in this region.4 Lateral aspect of the eyebrows are the most common location in head and neck region.3 Intraoral dermoids accounting for less than 1% of all lesions in the oral cavity.5Almost all cases were reported in the midline of the floor of the mouth or submental region but lateral dermoid cysts are extremely rare entities.3 Clinical appearance is non-specific and similarity to various oral lesions, clinicians and dentists may face some challenges in recognizing these conditions. Thus, accurate diagnosis requires histopathological evaluation.

CASE PRESENTATION

A 23 year old female presented with a slowly enlarging painless swelling in right submandibular region extending to left side since 3 years.Swelling was not associated with any symptoms like dysphagia, dyspnea, difficulty in articulating speech and no other associated symptoms, such as fever, previous history of trauma.She is lactating at present and is a known case of hypothyroidism under medication since 3 years.On extraoral examination gross facial asymmetry was noted on the left side with a swelling of approximately 5 × 4 cms that was soft,non-tender,non-pulsatile in nature extending to the left submandibular region.(figure 1)

Figure 1: Swelling extending to the left submandibular region

Intraorally, no findings were relevant other than a grossly decayed permanent mandibular first molar. Laboratory studies were within normal limits. Further radiographic investigations, transillumination tests and fine needle aspiration cytology was carried out followed by biopsy.

Transillumination was negative. Ultrasound (US) demonstrated a well-circumscribed, avascular mass in the left side of the oral cavity. The mass had internal lobular echogenic areas and curvilinear anechoic areas. Magnetic resonance imaging revealed a well defined thin walled T2 hyperintense lesion measuring 2.3x1.7x4.0 cms noted in the floor of the mouth epicentered in left sublingual space extending into left submandibular space of neck across the left mylohyoid muscle.(figure 2).

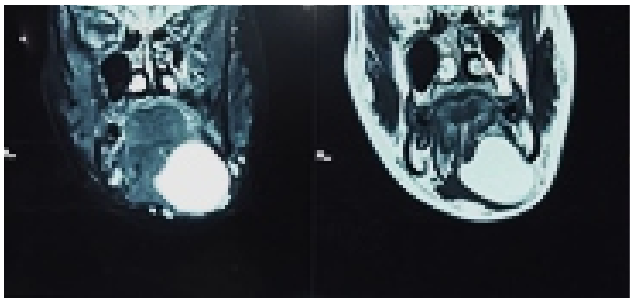

Figure 2:A well defined T2 hyperintense lesion extending to the left submandibular space

FNAC findings were of inflammatory lesion.For definitive diagnosis and management,surgical removal was done followed by histopathological examination. 8 slimy whitish brown coloured thin walled soft tissue bits were received after biopsy with the largest bit measuring 4.5x3x0.4 cms and also containing keratinaceous cheesy material and hair.(figures 3,4)

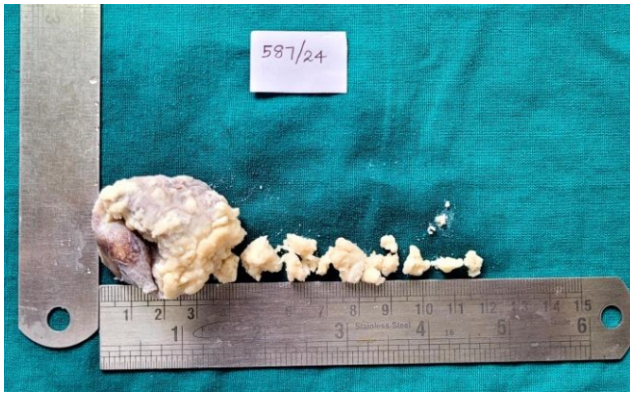

Figure 3:Specimen received after biopsy

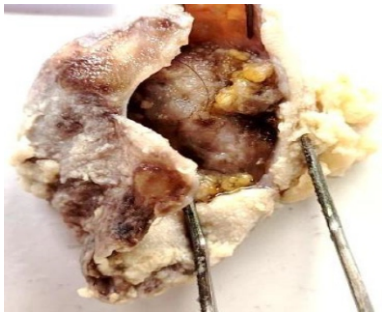

Figure 4:Thin-walled cyst with hair and keratin like material within the lumen

Histolopathological examination showed keratinized stratified squamous epithelium with prominent orthokeratinization.The underlying connective tissue capsule had skin appendages like sebaceous glands and hair follicles which was definitive for the diagnosis of dermoid cyst. Cystic lumen was filled with keratin and adipose tissue. (Figure 5,6)

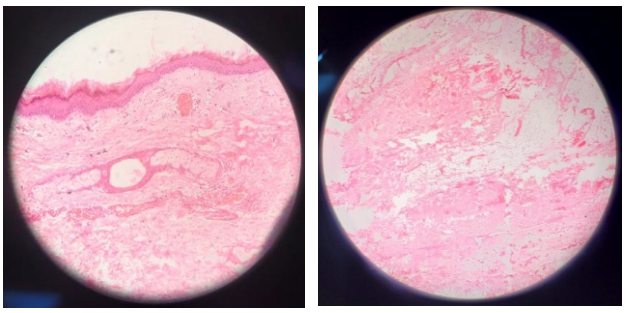

Figure 5:The microscopic exam showed a cystic lesion with cavity lined by squamous stratified epithelium hyperorthokeratinized with cutaneous attachments, such as sebaceous glands and hair follicles.Figure 6:The cystic cavity with keratin material.

DISCUSSION

Dermoid cysts are a developmental cyst lined by epithelium resembling epidermis and contain dermal adnexal structures such as sebaceous glands, hair follicles, or sweat glands in the cyst wall. Not uncommonly found in the head and neck, almost seven percent of dermoid cysts in this region are located in the floor of the mouth.6 While dermoid cysts can be seen at any age, the highest incidence is reported between 15 and 35 years of age which is in accordance with our case. No gender predilection. Regarding the anatomical site, midline of the floor of the mouth is the most affected by dermoid cysts,3 followed by the lips and the tongue but in our case the site was lateral floor of the mouth. Based on the etiology, dermoid cysts may be congenital or acquired. The congenital type found in the cervicofacial

region is derived from entrapment of epithelial cells during midline fusion of the first and second branchial arches during embryonic development. Acquired forms develop from traumatic or iatrogenic implantation of epithelial cells into the mesenchyme of jaw leading to proliferation of epithelial cells in the deeper tissues. In our case, there was no traumatic history noted and onset was insidious.7 Depending on the anatomic location of the cyst and the muscles of the floor of the mouth, dermoid cysts may be defined as sublingual or submental.7 Mouth lesions are always located

above the mylohyoid muscle,but may be found above or below the geniohyoid.If above the geniohyoid,the cyst is located between the geniohyoid and genioglossus and presents primarily as a sublingual swelling in the floor of mouth. Conversely,if the cyst is below the geniohyoid,it is located between geniohyoid and mylohyoid and presents as an extraoral swelling in the submental region.3 Lateral cysts appear to be rare and probably not more than 12 cases reported till date.8 These are considered to be midline cysts that have become displaced and bulge over the posterior aspect of mylohyoid muscle to enter the submandibular space as in our case. Dermoid cysts usually develop insidiously and patients not becoming aware of their presence until they are large enough to interfere with eating, speaking or swallowing. In this case, there was neither extension into the midline nor any displacement of the tongue, leaving our patient largely asymptomatic. Uncommonly, cysts may rupture and present an acute inflammatory response. Malignant transformation is rare, reported as less than 5%.9

Transillumination was negative supporting dermoid cyst but FNAC was non-specific in this case. FNAC of the cyst may provide sufficient diagnostic material, but when only the copious keratinaceous cyst contents and relatively scarce epithelium given will often yield inconclusive results thereby creating a potential sampling bias.10

Radiographic analysis is very useful in diagnosis. Ultrasound imaging is the initial diagnostic modality of choice for oral lesions.11 Dermoids appear as well-circumscribed, unilocular cysts that may contain either anechoic or hypoechoic regions because of the presence of epithelial debris or skin appendages as in our case.

However, compared with ultrasonography, computed tomography and magnetic resonance imaging (MRI) are more advantageous because they provide accurate information about the location, size, and extension of the lesion facilitating surgical planning.12 In this case, MRI revealed a well defined thin walled T2 hyperintense lesion in the floor of the mouth extending into left submandibular space. Both USG and MRI findings were supportive to dermoid cyst.

CT scan demonstrates a thin-walled, unilocular mass filled with homogenous, hypo-attenuating material containing multiple hypo-attenuating fat nodules. This gives a “sack of marbles” appearance that is pathognomonic for dermoid cysts.CT or MRI imaging best delineates the internal architecture of dermoid cysts and facilitates exact visualization of the location of the lesion in relation to the surrounding anatomy to guide surgical management.11

The mylohyoid muscle separates the sublingual from submental and submandibular spaces and is a key landmark used to determine whether an intraoral or extraoral approach is most appropriate during surgery. Lesions above the mylohyoid are typically operated on intraorally, whereas those below the muscle are removed using an extraoral approach.13

Differential diagnosis to be considered are Ranula, Abscess, Epidermoid cyst, Lipoma, Sialadenitis, Hemangiomas, Lymphangiomas, Sialolithiasis, Branchial cleft cyst and thyroglossal duct cyst, Lymphadenitis, Neoplasms etc…11

Surgical excision and biopsy is diagnostic for dermoid cysts. Grossly, these cysts are thin-walled (2-6 mm thick) and often contain an oily, pale yellow keratinous material all of these were matching with our case.

Histologically, dermoid cysts are lined by stratified squamous epithelium usually without rete pegs,but with prominent orthokeratinization.Skin appendages like sebaceous glands,sweat glands and hair follicles are evident in the cyst wall. Lumen may be filled with mature adnexal structures of mesodermal origin, such as hair follicles and shafts, adipose tissue, sebaceous and eccrine glands.7 Excluding the sweat glands, all findings were supportive and doesn’t confuse the diagnosis as sweat glands are not that common in the cyst wall compared to sebaceous glands.

Three histological types are visible in DC, namely, teratoma, epidermoid cyst, and DC. Epidermoid cyst lacks adnexal parts, a simple squamous epithelium with a fibrous wall surrounding it. True DC is an epithelial lined cavity that has sweat and sebum glands as well as hair follicles in the cyst wall, along with keratinization like our case. A compound cyst, also

known as a teratoid cyst, is lined by ciliated to simple squamous epithelia and contains derivatives of ectoderm, mesoderm, and endoderm. Each of the three groups can have some keratinous content.

An orthokeratinized odontogenic cyst also presents with similar histology should also be included in the differential. Focal sebaceous cells are acceptable, but if extensive diagnosis of an intraosseous dermoid cyst to be considered.[14]

Excision without damaging the cyst wall is the accepted treatment of choice for managing DCs. In the present case, the lesion was managed by excision without damaging the cyst wall. Patient was followed up for 3 months. Prognosis following surgical removal is excellent, and postoperative complications are minimal. It is uncommon for a DC to undergo malignant transformation. The most frequent change is to squamous cell carcinoma.[15]

CONCLUSION

Dermoid cysts do present occasionally as lateral mass. In cystic masses FNAC value is limited, and CT/MRI will help in extent of mass, to arrive at a probable diagnosis, to plan for treatment. Histopathological examination is confirmatory in these cases. Even though characteristic radiological and histopathological features make the diagnosis simple yet, it may be difficult to diagnose, if present at unusual locations. This case report illustrates the need to include DCs also in the differential diagnosis of swellings in the oral cavity even if the location is not pathognomonic. DCs are removed to avoid infection, establish a histopathological assessment, and improve an aesthetically deforming condition. Recurrence is rare if complete excision of the lesion is performed.

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Management of Natal and Neonatal Teeth in Pediatric Dentistry : A Case Series

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ABSTRACT

Dental caries is one of the most prevalent chronic disorders in children. Treating severely destructed teeth has become a challenge for pedodontists considering three important strategies patient's behavioural management, tooth structure preservation, and satisfaction of parents. Maximum efforts have been made for full coverage restorations in pediatric dentistry. Every material has its own merits and demerits. Nowadays many options are available like- stainless steel crowns, strip crowns, zirconium crowns, etc for restoring the normal form of the tooth.

The article is a narrative review, we have considered the articles from 2002 – 2022 and collected the information and included in this article.

Keywords: Crowns, Pediatric, Dental caries, Preformed crowns.

INTRODUCTION

One of the most prevalent infectious diseases affecting children's teeth is dental caries. Children's tooth decay is a serious public health concern, affecting 60%-90% of children(WHO Report 2003)[1]. Primary teeth are usually destructed either due to caries or traumatic injuries. Teeth need to be restored due to loss of crown structure following caries or traumatic injury[2].

Early childhood caries are dental problems that affect extremely young children. The American Academy of Pediatric Dentistry claims that, "the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger".

Rampant caries can occur in primary, mixed, or permanent dentition. Research has revealed that it affects 1 to 12 percent of the pediatric population in developed countries, and up to 70 percent in underdeveloped countries. Kaste et al. (1996) reported caries incidence of 18 percent in 2 to 4-year-old and 52 percent in 6 to 8-year-old children[1].

The loss of the primary maxillary anterior teeth dominates a child's physical appearance and has a negative impact on phonetics, compromised mastication, the development of abnormal oral habits, neuromuscular imbalance, and difficulties with the child's social and psychological development. Primary posterior teeth are important for mastication, as natural space maintainer and to establish proper occlusion; loss of which can result into space loss, malocclusion, and impaction of succedaneous teeth. Hence, maintenance of primary teeth is mandatory. However, these issues are overlooked by most of the parents resulting in to difficulties in eating, establishing social contacts and speaking. Even though primary teeth are temporary dentition, they should be retained within the mouth in nonpathologic state until exfoliation[3].

DISCUSSION :

The problem of dental decay in children's teeth is a major public health issue. There are several approaches for offering full coverage restoration for the primary dentition, each with its own set of benefits and drawbacks.

Ideal requirements for pediatric crown[4]:

- Should be aesthetically acceptable/should have natural color
- Should last until exfoliation of primary teeth (durable)
- Should be biocompatible and not cause irritation to gingiva
- Easily and rapidly placed
- Cost effective
- Should require one visit treatment
- Aesthetic covering should not chip off while clinical manipulation or during use in oral cavity
- Should maintain tooth integrity
- Should maintain mesiodistal space until eruption of successor teeth
- Should retain masticatory function
- Should not abrade opposing teeth.

Objectives of crown placement[4]:

- To repair and restrict the damage caused by caries
- To protect and preserve tooth structure
- Re-establish adequate function
- Restore esthetics.

Indications (According to the clinical guidelines for the AAPD)[4]:

- Children with more risk have anterior and/or posterior decay
- Children with extensive decay
- Large lesions or multiple surface lesions
- Pulpally treated teeth
- Involved incisal edge
- Extensive cervical caries
- Minimal caries but poor oral hygiene
- Difficult to control moisture due to child behaviour management problems. Other Indications
- Hypoplastic defects
- Significant trauma-related tooth loss or fracture
- Psychologic benefit
- Posterior crown aiding in mastication and maintaining arch length
- Unesthetic incisors as a result of intrinsic stain or discolouration.

Contraindications:

- Nonrestorable teeth
- Teeth that can be restored by conventional means.

Classification of crowns:

Babaji et al, proposed[4]

Depending upon the Material Used

- Metallic crown
  - A crown made of stainless steel (SSC/PMC)
  - Aluminium crown
- Crowns made of stainless steel (SSC) with facing
- Resinous/composite crown
  - Strip crown – Composite shell crown
  - New millennium crown
  - Glass ionomer crown
  - Polycarbonate crown
  - Kudo crown
  - PedoNatural crown
  - Pedo jacket crown
  - Artglass crown.
- Preveneered crowns made of stainless steel : Crowns made of stainless steel with composite, resinous, HDP, polyethylene or epoxy facing

  - NuSmile crown
  - Flex crown
  - Pedo pearls
  - Cheng crown
  - Whiter Biter crown
  - Pedocompu-crown
  - High density polyethylene (HDPE) crown
  - Dura crown.
- Ceramic (Zirconia) crown
  - ZIRKIZ crown
  - EZ-crown
  - Kinder Krown
  - CEREC crown
  - Ceramo basemetal crown.
- Biologic crown

Preformed metal crowns (PMC)5:

Preformed metal crowns, were introduced to pediatric dentistry and are referred to as stainless steel crowns in 1950 by Humphrey. Originally made of stainless steel, they went by the abbreviation of SSC. However, the metal that was used was changed to nickel-chromium best known as a preformed metal crown (PMC). They have become the foremost restorative material used to treat caries and decayed primary teeth. They are typically regarded as having a longer clinical lifespan than two or three-surface amalgam restorations and being preferable to multi- surface amalgam restorations. SSC is mostly less used and it is less appreciated as restoration for primary dentition. It can be placed easily and quickly while being durable and comparatively less expensive. It is less technique-sensitive when it comes to placement and provides the advantage of full coronal coverage. One benefit of these crowns is that they don't react negatively to changes in the mouth during cementation or implantation. This is frequently observed in clingy, stubborn kids where a well-fitting crown can be placed without sacrificing the restoration's quality. However, the primary flaw with SSC is its unappealing shiny silver appearance.

Types of Crowns made of stainless steel:

- Pretrimmed crowns
- Pre contoured crowns
- Preveneered crowns

Open faced stainless steel crowns 6:

The PMC is the most durable and most reliable restoration for a primary incisor that requires complete coverage but it is unesthetic. The dentist can remove the portion of the crown that is visually noticeable, remove enough luting cement to create retentive undercuts, and fill the space with bonded resin composite to preserve PMC's benefits and enhance the appearance of treated teeth.

Preveneered Crowns made of Stainless Steel :

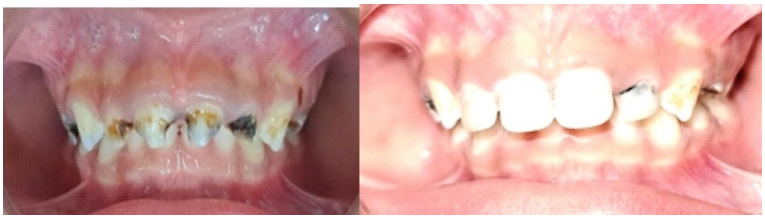
Preveneered crowns made of stainless steel provide a good aesthetic and long-lasting restoration for grossly decayed primary teeth. These crowns are a combination of the durability of conventional SSC with the esthetics of composite resin. The facing materials available for these crowns are thermoplastic resin or composite resin bonded to the stainless steel crown. These aesthetic veneers are retained on the SSCs utilizing a range of chemical and mechanical bonding approaches. Initially preveneered crowns were developed for primary anterior teeth; later preveneered crowns for primary molars were developed. There are several commercially available preveneered

crowns made of stainless steel varieties that vary in terms of color, length of the crown, facing attachment method to the SSC, and crown crimping skill of the clinician.

The most popular restorative method for preserving the residual tissue in severely decaying and damaged teeth is the placement of stainless steel crowns. For over fifty years, stainless steel crowns have proven to be more durable and long-lasting than crowns than amalgam and composite materials. When temporary full-coronal coverage is needed, no restorative material has actually been able to offer the advantages of affordability, dependability, and durability.

The primary drawback of SSC was its unaesthetic appearance12.

Strip Crown7:



They are seamless plastic crown forms without long cervical collars. Composite resin strip crowns are among the most esthetic and popular restorations used for decayed primary anterior incisors. These composite resin strip crowns have been used to repair the deciduous teeth that are carious for over 20 years. This is many clinician's first choice as it has superior aesthetics and it is easy to repair if any chipping off or fracture takes place. However the limitation is that it is the most technique-sensitive option. These strip crowns serve as a matrix for the reconstruction of composite in the anterior sector. Celluloid crowns were initially used for strip crowns, but now two other bonded alternatives are being used. The crowns help to 'seal' the underlying tooth from acid attacks and reduce the chance of future decay on the tooth.

Because the composite crown depends on dentin and enamel adhesion for retention, it is likely to be compromised if significant tooth structure is lost. Unacceptable aesthetic outcomes in teeth that had undergone endodontic treatment were noted in this investigation, as reported by Kupietzky et al. Resin-bonded composite strip crowns can be a strong and esthetic restoration for essential carious primary incisors, even if the restorations were chipped or there was caries in the gingival margin. The color was still appropriate for vital teeth7.

This study's7 high success rate for resin-bonded composite strip crowns over a lengthy follow-up period indicates that this treatment approach is a suitable and aesthetically pleasing way to restore young children's damaged primary incisors. Teeth with three or more surfaces decayed have a reduced retention rate, especially in kids who are at a higher risk of developing caries.

Zirconia pediatric crowns8:

Zirconia crowns provide excellent aesthetics because of their natural appearance and have been successfully used for permanent teeth for many years. These crowns, which are suitable for both anterior and posterior situations, are relatively new in the field of dentistry for children, having been introduced in 2010. It is unique and has the ability to resist cracking by transforming from one crystalline phase to another, and there is a rise in the resultant volume stopping the crack.

It has excellent biocompatibility, resistant to corrosion, and high wear resistance. In recent times, the zirconium dioxide ceramic prefabricated crown has been applied to teat primary teeth. The tooth preparation for the zirconia crown will take longer than other preparations of teeth. Hence, this cannot be used in uncooperative children for long procedures. These crowns are difficult to adjust as they are ceramic in nature and cannot be trimmed

with scissors like SSC. High-speed fine diamond burs with a lot of water should be used due to excessive heat released that could cause a fracture in the crown. It is not recommended to adjust occlusal and interproximal, as this willremovet h e glaze of the crown and create a weak area of thin ceramic. Since these crowns cannot bend, they must fit passively; trying to force the crown into place will cause a fracture. The crown should fit passively and completely, in a subgingival position without affecting the gingival tissue. Cementation is a concern as it is difficult to etch and bond due to the deficit of silicone in glass ceramic. As a luting agent, self-adhesive or traditional resin cement can be utilized. These crowns contain no metal and are made of zirconia. They are one of the dominant types of ceramics used for various computer-aided design /computer-aided manufacturing restorations, including hand veneer/framework, framework/milled veneer, implant abutments, full-contour fixed prosthodontics, and large implant-supported substructures. As of now it is the most durable dental ceramic at the market and is also aesthetically pleasing.

Some of the commercially available pediatric zirconia crowns are:

1. E Z Pedo crowns
2. NuSmile Zirconia crowns
3. Cheng Zirconia pediatric crowns
4. Kinder Zirconia pediatric crowns

More aesthetically pleasing crown choices are being sought after by dental professionals and parents of children in need of restorative dental care. The newest, most distinctive, and esthetic pediatric dental crowns on the market right now are zirconia crowns. A new method for minimally invasively restoring a child's smile's natural appearance has been made possible using zirconia crowns. Zirconia crowns need less chair time and have better aesthetics and a more natural appearance. It is appropriate for clinical situations requiring a high degree of esthetics, including repairing anterior teeth, due to its moderate amount of translucency. A wide range of clinical scenarios can be accommodated by zirconia-based restorations due to their excellent strength, accuracy, and translucency balancing8.

Polycarbonate Crowns9:

In pedodontic practice, the most common lesions which occur are due to nursing bottle caries. More severely carious teeth require either composite crowns, stainless steel crowns, or polycarbonate crowns. Polycarbonate crowns are 'temporary crowns given as fixed prosthesis to primary anterior teeth which are likely to get exfoliated in future'. These are carbonic linear polyesters. These are termed thermoplastic resins as they exhibit high impact strength and rigidity and can be molded into solids by pressure and heat into the required form. Esthetically these were appealing but the disadvantages were brittle and no resistance against strong abrasive forces. Polycarbonate Crowns Include:

- 3M ESPE Polycarbonate
- Kudos polycarbonate crowns
- Pedo Natural Crowns

Pedo Jacket Crowns9:

The use of the pedo jacket crown is similar to that of celluloid crown form, except that the pedo jacket is made up of a tooth-hued copolyester substance, which, after polymerization, is filled with resin and left on the tooth rather than being removed.

New Millenium Crowns10:

The crowns are esthetic and even can be trimmed and reshaped with a high-speed bur. These crowns are more susceptible to fracture or crack if forced into a preparation that has not been reduced adequately.

Cheng Crowns10:

These were developed by Peter Cheng in the year 1982. These are crowns with a facing of pure resin which makes them stain resistant. These can be used for both anterior and posterior teeth. Advantages are less time consuming less technique sensitive, require a single patient visit, less patient discomfort, and is stain resistant.

Dura Crowns9:

These pre veneered crowns are esthetic and can be placed with poor moisture or hemorrhage control. These are made up of high-density polyethylene veneered crowns.

Kinder Crowns10:

These are known for providing shades that appear natural and shape in relation to the patient.. They made their debut in 1989. Kinder crowns are known for their finely feathered margins, scientifically developed shades, incisal edge. They are offered for anterior or posterior teeth and come in the form of Kids crowns made of zirconia or preveneered kids crowns.

Pedopearls10:

These are aluminium crown forms having a coating of a tooth-coloured epoxy paint. These are comparatively softer, and in heavily occluded places, they could cause the epoxy paint to wear off. As they are softer can be easily crimped and cut but durability is poor.

Golden crown11:

Shinhung Co. Ltd. recently unveiled the Kids Crown (Shinhung, Seoul, Korea)—a titanium-coated stainless steel crown with an additional benefit over traditional stainless steel crowns. They are the SS crown having natural golden lustre by titanium coating, which offers superior aesthetic finish with easy manoeuvrability and reduce chair side time. Bamdadian Z et al. (2019) evaluated characteristics of several primary molar stainless steel crown brands; the results showed that kids crowns had satisfactory mechanical and physical characteristics. According to the study conducted by Bhat P et al, showed that the parental and patience acceptance was more better with golden crown compared to stainless steel crown12.

Titanium-nitride coated (TiN) SSC has been introduced and available for use. TiN coating gives the crown a bright, yellow appearance, and it might also increase the surface's durability. Children are drawn to the golden color of the crown because it seems more endearing to them.

Compared to conventional SSC, titanium-coated SSC offers an additional benefit because it is easier to manoeuvre and requires less chair side time12.

CONCLUSION:

- An attempt has been made to integrate the various methods for full coverage restorations in pediatric dentistry practices through this manuscript. Every method and material has benefits and drawbacks of its own.
- There are numerous solutions available for pediatric children with carious teeth, as is addressed, ranging from crowns made of stainless steel to its several modifications to other esthetic crowns such strip crowns and zirconium crowns, which are becoming more popular.
- Variables include dentist preferences, parental desires for aesthetics, the child's behavior, and the management of moisture and bleeding can have an impact on the choice of restorative outcome and its final result.

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Indian Dental Association
Bengaluru Branch

CDE Activities and Report for the year 2025-26
IDA Bangalore Branch
CDE Convenor – Dr. Smitha T

The activities for the present year kick started from 20th January 2024.

1) DISASTER VICTIM IDENTIFICATION- Conducted in association with Colgate India Ltd. Guest speakers for the session Capt. Dr. Rohit Shetty and Capt. Dr. Suresh, held on 23rd January 2025 at Oxford dental college auditorium, Bangalore.

2) ROLE OF DENTISTS IN DISASTER VICTIM IDENTIFICATION- Conducted in association with V.S. Dental College and Hospital, Bengaluru. Guest speaker for the session were Dr. Deepak V, Dr. Mohan Kumar K P, Dr. Pramod R.C, Capt. Dr. Suresh T, held on 25th January 2025 at V.S. Dental College and Hospital, Bengaluru.

3) DIGITAL MINIMALISM SEMINAR FOR BRIGHT DENTISTRY – Conducted in association with Dentium. Guest speakers for the session Dr. S.M Chung and Dr. Deepak S. held on 1st February 2025 at Shangri-La Hotel, Bangalore.

4) QCI GUNVATTA YATRA- Awareness session on NABH programmes - Conducted in association with Quality Council of India (QCI). The session provided insights on Accreditation and Entry Level Dental Clinics Certification and Dental Healthcare Service provider. The event was held on 4th February 2025 at V.S. Dental College and Hospital, Bengaluru.

5) EDUCATIONAL TOUR TO KIDWAI INSTITUTE OF ONCOLOGY- Conducted in Association with V.S. Dental College and Hospital, Bengaluru. The house surgeons of V.S. Dental College and Hospital visited the institute and were provided insights into oncology and its multidisciplinary approach. The event was a 2 day tour organized on 13th and 14th of February 2025. Dr. Shobha Krishnappa, guided the interns through the campus, explaining various departments and their roles in cancer care.

6) NOX- THE GAME CHANGER: A Step Towards Painless Dentistry- Conducted in association with Andent and Nox analgesia Solutions. Guest speakers for the session were Dr. Vaibhav Patni and Dr. Srinidhi Bhatt. The event featured lecture with hands-on-workshop on Nitrous Oxide- Oxygen Inhalation Sedation. It was on 23rd February 2025 held at ManDent Children and Family Dental Clinic.

7) WOMEN'S DAY CELEBRATION AT V.S. DENTAL COLLEGE AND HOSPITAL- Conducted in association with National Service Scheme and Women's Dental Council, Bangalore branch. Guest speakers for the session was Mrs. Geetha Lakhshman who shared valuable knowledge on nutrition and yoga, emphasizing their role in women's overall well-being. The event was hosted by V.S. Dental College and Hospital,Bangalore on 8th March 2025.

8) WOMEN'S DAY CELEBRATION AT GDCRI- Conducted in association with Women Welfare Committee, GDCRI, National Service Scheme and Women's Dental Council, IDA Bangalore. Guest speakers for the session were Dr. Shashikala B Patil and Mrs. Geetha Lakhshman. The event was hosted by Government Dental College and Research Institute, Bangalore on 11th March 2025.

9) CAREER ORIENTATION SESSION ON OPTIONS IN DENTISTRY IN INDIA AND IN ABROAD- Conducted by IDA Karnataka and Global Healthcare Academy in association with Dentacme Coaching academy was hosted by IDA BANGALORE BRANCH and was held at V.S. Dental College and Hospital from 17th- 22th March 2025. Guest speakers for the session was Dr. Simranjit Singh who gave insights on PG courses, juniorship, army dental corps and house jobs after BDS.

10) CME PROGRAMME ON ORAL CANCER and PRECANCERS- Conducted in Association with Manipal Hospitals Old Airport Road. Guest speakers for the session were Dr. Poonam Patil, Dr. Devesh S Ballai, Dr. Srinivas K, Dr. Surekha Goyal held at The Chancery Pavilion Hotel, Residency Road, Bangalore on 27th April 2025. The event featured insightful talks on surgical, chemotherapy, and radiation treatment aspects of oral cancer. The event witnessed an audience of around 100 dentists and was moderated by Dr. Smitha T.

Indian Dental Association
Bengaluru Branch

CDH Programs by CDH Convenor Dr. Akshay V, IDA Bengaluru Branch

LIST OF CAMPS CONDUCTED BY VARIOUS DENTAL COLLEGES IN BENGALURU FROM JANUARY 2025 TO APRIL 2025.

The activities for the present year kick started from 05th January 2025.

CDH-01/2025 – Treatment Camp conducted at Vinayaka High School, Cubbon Pete, Bengaluru on 05-01-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 46, Oral prophylaxis: 15, Restorations: 5

CDH-02/2025 – Screening & Treatment Camp conducted at Halaguru Vidya Institute, Mandya District on 05-01-2025 by the Dept. of Public Health Dentistry, V.S. Dental College.

Patients screened: 135, Oral prophylaxis: 18, Restorations: 10, Extractions: 5

Remarks: 33 patients treated

CDH-03/2025 – Screening Camp conducted at Bangalore Institute of Technology, V.V. Puram on 09 & 10-01-2025 by the Dept. of Public Health Dentistry, V.S. Dental College.

Patients screened: 253

Remarks: Referred to dental college for treatment

CDH-04/2025 – Treatment Camp conducted at Sri Soma Sai Skanda Ashram, Mandya District on 18-01-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 29, Oral prophylaxis: 18, Restorations: 6, Extractions: 2

CDH-05/2025 – Treatment Camp conducted at Crescent English School, Chamrajpet, Bengaluru on 26-01-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 119, Oral prophylaxis: 33, Restorations: 16

CDH-06/2025 – Treatment Camp conducted at Vedanta School, Laggere, Bengaluru on 26-01-2025 by the Dept. of Public Health Dentistry, V.S. Dental College.

Patients screened: 104, Oral prophylaxis: 16, Restorations: 6

Remarks: 20 patients treated

CDH-07/2025 – Treatment Camp conducted at Omshree Public School, Hoskote, Bengaluru on 11-02-2025 by the Dept. of Public Health Dentistry, V.S. Dental College.

Patients screened: 373

Remarks: 84 patients treated

CDH-08/2025 – Treatment Camp conducted at PHC, Hosalli, Doddaballapur on 08-02-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 54, Oral prophylaxis: 20, Restorations: 11

CDH-09/2025 – Treatment Camp conducted at Sri Soma Sai Skanda Ashram, Mandya District on 15-02-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 36, Oral prophylaxis: 12, Restorations: 7, Extractions: 5

CDH-10/2025 – Screening Camp conducted at Oasis International School, Kannuru, Bengaluru on 24-02-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 276

CDH-11/2025 – Treatment Camp conducted at Franciscan Institute, Tavarekere, Bengaluru on 12-03-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 101, Oral prophylaxis: 22, Restorations: 15, Extractions: 3

CDH-12/2025 – Treatment Camp conducted at Sri Soma Sai Skanda Ashram, Mandya District on 15-03-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 25, Oral prophylaxis: 12, Restorations: 5, Extractions: 3

CDH-13/2025 – Treatment Camp conducted at Maddur, Karnataka on 15-03-2025 by the Dept. of Public Health Dentistry, V.S. Dental College.

Patients screened: 53

Remarks: 16 patients treated

CDH-14/2025 – Screening Camp conducted at Basavanagudi, JC Road, Shankarnagar, Bengaluru on 16-03-2025.

Patients screened: 174 (120 + 54 at two locations)

CDH-15/2025 – Treatment Camp conducted at Pragathi Charitable Trust, Siddapura, Bengaluru on 22-03-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 74, Fluoride application: 31

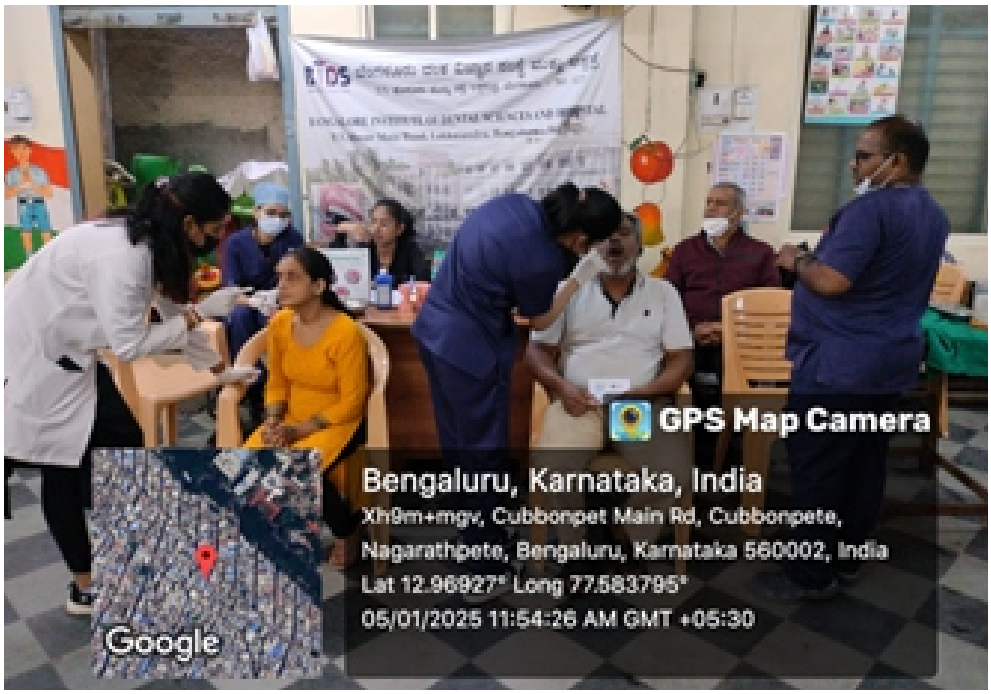
Remarks: World Oral Health Day (celebrated on 20-03-2025)

CDH-16/2025 – Screening Camp conducted at Footprints Montessori, Billekali, Bengaluru on 07-04-2025 by the Dept. of Public Health Dentistry, BIDS.

Patients screened: 75

Remarks: World Health Day

CDH Activities



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