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Editorial

The Editor of the " UPDATES IN DENTISTRY" had the audacity to publish my views from dentistry. As I write this column, we are living under the shadow of the corona-virus pandemic. The morbidity and mortality statistics are truly frightening at this point and are supposed to get much worse. Amidst this pandemic, this journal continues its normal publication schedule, thanks to the production team they are doing right now in the face of this global crisis.

With the concern of infection control in health care settings, personal protective equipments (PPE) have been given to many individuals. American Dental Association advised all the dental practices to cease non-emergent in-person care to reduce the infection rate and started to rebuild stockpiles of PPE for health care providers.

Many people today enjoy excellent oral health and are keeping their natural teeth throughout their lives. But for some, caries are still the most prevalent chronic disease of childhood. Too many people mistakenly believe that they need to see a dentist only if they are in pain or something is wrong.

Dentistry promotes continuity of care that is comprehensive, convenient, cost effective and efficient. Their responsibilities include diagnosing of oral diseases and promoting oral health and its prevention. Even the routine procedures such as tooth extractions, preparing and placing fillings, carry potential risks of complications such as infection, temporary or even permanent nerve damage, prolonged bleeding, pain etc. Dentists can spot early warning signs in t he mouth that may indicate disease elsewhere in the body. Regular dental visits and care will help maintain and improve optimal health throughout their lifetimes.

With people around the world wondering what the future will hold after this pandemic, I remain confident that our profession will not only survive but thrive. My confidence is even deeper, with a passion for symmetry, perfection and beauty to unlock each patient's epitome of a perfect smile.

Going forward with the most rewarding thing, the patient's happiness and satisfaction and the stability of the results.

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A Case Report

ADVANCING SMILE AESTHETICS: LASER-ASSISTED GINGIVAL DEPIGMENTATION A-CASE REPORT

Dr. Sajan, Dr. Rajni Aggarwal, Dr. Archana Bhatia, Dr. Anmol Kaswan, Dr. Ruchika

ABSTRACT

Gingival pigmentation, while physiologically benign, can pose an aesthetic concern, particularly in individuals with a high smile line. Laser-assisted gingival depigmentation has emerged as a minimally invasive, effective approach to addressing this issue. This case report details the treatment of a 30-year-old female patient presenting with diffuse melanin pigmentation across the maxillary and mandibular gingiva. A diode laser (Biolase, 940 nm) was utilized in a stepwise approach to remove the pigmented epithelium. The procedure was bloodless, with no discomfort reported, and rapid healing observed within one week. At the three-month follow-up, the gingiva retained its aesthetic appearance without recurrence. The diode laser's precision, reduced postoperative complications, and enhanced patient satisfaction highlight its utility in aesthetic periodontal procedures. This report underscores the transformative potential of diode lasers in achieving predictable and long-lasting depigmentation outcomes.

INTRODUCTION

The health and aesthetics of the gingiva are vital components of an appealing smile, complementing the lips, teeth, and facial structure . Gingival pigmentation, a natural phenomenon, varies widely among individuals and correlates with cutaneous pigmentation. Similar to skin color, gingival pigmentation ranges from light pink to dark brown or black, differing across ethnicities and geographical regions. Melanin pigmentation in the gingiva is observed in all ethnicities[1]. Gingival color is determined by factors such as epithelial thickness, vascularity, keratinization, and the presence of pigments, primarily melanin. This brown pigment is produced by melanoblasts in the basal layer of the gingival epithelium, where it becomes interspersed among epithelial cells. The gingiva is one of the most commonly pigmented areas of the oral mucosa[2].

Often referred to as physiological or racial pigmentation, gingival hyperpigmentation is considered a benign genetic trait observed in individuals of all ages and genders. It is more prevalent in individuals with darker skin tones and may also occur in association with systemic conditions like Addison's disease, Peutz-Jeghers syndrome, and neurofibromatosis. Although non-pathologic, pigmentation can become an aesthetic concern, especially for individuals with a high smile line.

Gingival depigmentation is a cosmetic periodontal procedure aimed at reducing or eliminating hyperpigmented areas to enhance smile aesthetics. It is an elective treatment chosen by patients concerned about their appearance, as it has no direct clinical indication. Techniques for depigmentation include chemical methods (e.g., phenols and ascorbic acid), surgical approaches (scalpel surgery, gingival abrasion), and advanced modalities such as free gingival grafting, acellular dermal matrix allografts, electrosurgery, cryosurgery, and laser therapy[3].

Among these methods, laser-assisted depigmentation has emerged as a preferred option due to its minimally invasive nature, precision, and superior patient outcomes. Diode lasers, in particular, are highly effective in targeting melanin-rich tissues while minimizing trauma to surrounding structures. Their advantages include reduced bleeding, less postoperative discomfort, faster healing, and antibacterial effects, contributing to improved postoperative care and outcomes.

This article details a case of gingival depigmentation using a diode laser, focusing on its effectiveness and aesthetic benefits. The patient was followed for 90 days to evaluate healing, recurrence, and satisfaction. By highlighting the clinical advantages of laser therapy, this report underscores its transformative role in achieving aesthetic periodontal outcomes.

CASE PRESENTATION

A 30-year-old female patient visited the Department of Periodontology & Oral Implantology with concerns about dark pigmentation in her gums, which she felt affected her smile aesthetics. The pigmentation had been present since childhood, consistent with physiological melanin pigmentation. The patient expressed a desire for an aesthetic enhancement. She maintained good oral hygiene and had no relevant systemic health issues.

Clinical examination revealed diffuse melanin pigmentation extending across the maxillary and mandibular arches, from the right canine to the left canine (Fig. 1). Phase I therapy, including scaling and polishing, was completed. After discussing various depigmentation options, the patient opted for laser-assisted depigmentation due to its minimally invasive approach and faster healing.

Fig.1 PRE-OPERATIVE VIEW

Local anesthesia was administered for comfort, and a soft-tissue diode laser (Biolase) was used for the procedure. The laser was set to a wavelength of 940 nm with a power of 4 W in continuous wave mode. A stent was prepared to ensure precision and protect surrounding tissues.[4]

Depigmentation was carried out first on the maxillary arch, followed by the mandibular arch a week later. The laser tip, used in contact mode, was moved horizontally along the pigmented gingiva, parallel to the root surfaces, to prevent overheating and ensure even pigment removal (Fig. 2). Saline irrigation was used throughout to cool the tissue and clear debris. The treated areas were then cleaned with saline-soaked gauze to remove residual pigment.

Fig.2 LASER ASSISTED DEPIGMENTATION

The procedure was bloodless, and the patient experienced no discomfort. A periodontal pack was applied postoperatively, and care instructions were provided, including maintaining oral hygiene and avoiding irritants like spicy or hot foods (Fig. 3).

Fig.3 COE-PACK PLACED

At the one-week follow-up, the periodontal pack was removed. The patient reported no pain, and healing was uneventful, with healthy, pink gingiva evident. At the three-month review, the results remained stable, with no recurrence of pigmentation. The gingiva retained a uniform and aesthetically pleasing appearance. The patient expressed satisfaction with the outcome and an increased sense of confidence.

Fig.4 After 1 Week Followup

POST-OPAFTER 1 WEEK

This case highlights the effectiveness of diode laser-assisted gingival depigmentation in addressing aesthetic concerns with minimal discomfort and quick recovery.

DISCUSSION

The use of lasers in gingival depigmentation has gained significant interest in recent years, offering a minimally invasive and efficient alternative to conventional surgical methods. Laser-assisted depigmentation not only enhances the aesthetic appearance but also ensures a better patient experience with

reduced postoperative discomfort and faster healing. Among the various lasers employed, diode lasers have proven to be a reliable and effective option for treating gingival pigmentation due to their properties and ease of use.

The diode laser, commonly set at wavelengths such as 810 nm and 980 nm, operates on the principle of selective photothermolysis, wherein melanin strongly absorbs near-infrared wavelengths. This makes it particularly suitable for targeting melanin in the basal layer of the gingival epithelium. Unlike non-ablative laser methods, the ablative technique employed with diode lasers allows precise removal of pigmented epithelium, ensuring effective depigmentation with minimal damage to surrounding tissues.

One notable advantage of diode lasers is their ability to control thermal impact on soft tissue. Proper calibration of laser settings is essential, as excessive energy density may lead to collateral thermal damage. Using low power settings (e.g., 0.8 W) to activate the laser tip helps achieve tissue excision through thermal conduction while preserving tissue integrity[5]. This technique minimizes heat damage, leading to rapid re-epithelialization and reduced healing time, as observed in this case.

The diode laser's deeper penetration into tissues and its specific absorption by melanin-containing cells, such as melanophages in the lamina propria, make it highly effective in depigmentation procedures. Additionally, its thermal effects contribute to sealing blood vessels, reducing intraoperative bleeding, and ensuring a clear surgical field. This also delays melanocyte migration, thereby lowering the risk of pigmentation recurrence[6].

Comparative studies highlight the advantages of diode lasers over conventional methods. For instance, a study by Hassan et al. (2022) compared scalpel and diode laser treatments in a split-mouth approach. Both techniques yielded similar healing outcomes, but the diode laser was noted for providing better intraoperative control with its charred layer functioning as a natural dressing, minimizing bleeding and the need for postoperative care[7].

Other case series, such as those by Elemek E., emphasize the patient comfort and aesthetic outcomes associated with diode laser depigmentation. These studies reported effective results at follow-up intervals of one week, four weeks, and three months, with no recurrence of pigmentation. The high patient satisfaction underscores the potential of lasers as a preferred choice for depigmentation procedures[8].

Despite these advantages, the high cost of laser equipment remains a limiting factor for widespread adoption. However, the long-term benefits, including low recurrence rates, reduced postoperative complications, and enhanced patient experience, often outweigh the initial expense.

In the present case, the use of a diode laser demonstrated excellent outcomes, with uniform depigmentation, rapid healing, and no adverse effects. These findings align with existing literature supporting diode lasers as an effective and safe modality for gingival depigmentation. Further studies with larger sample sizes and longer follow-up periods are recommended to strengthen the evidence base for laser-assisted depigmentation.

CONCLUSION

Laser-assisted gingival depigmentation, particularly with diode lasers, is a reliable and effective technique for addressing physiological melanin pigmentation. It offers advantages such as precision, minimal discomfort, rapid healing, and reduced recurrence rates compared to conventional methods. This case demonstrates that diode lasers are a safe and efficient option for enhancing gingival aesthetics, making them a valuable tool in periodontal plastic surgery.

REFERENCES

1. Verma S, Gohil M, Rathwa V: Gingival depigmentation. Indian J Clin Pract. 2013, 23:801-3

2. Prabhuji M, Madhupreetha S, Archana V: Treatment of gingival hyper-pigmentation for aesthetic purposes using the diode laser.

Laser. 2011, 2:18-9.

3. Alasmari DS. An insight into gingival depigmentation techniques: The pros and cons. Int J Health Sci (Qassim). 2018 Sep-Oct;12(5):84-89.

4. Giannelli M, Formigli L, Bani D. Comparative evaluation of photoablative efficacy of erbium: yttrium-aluminium-garnet and diode laser for the treatment of gingival hyperpigmentation. A randomized split-mouth clinical trial. J Periodontol. 2014;85(4):554–61.

5. Altayeb W, Hamadah O, Alhaffar BA, Abdullah A, Romanos G: Gingival depigmentation with diode and Er,Cr:YSGG laser: evaluating re-pigmentation rate and patient perceptions. Clin Oral Investig. 2021, 25:5351-61

6. Ozbayrak S, Dumlu A, Ercalik-Yalcinkaya S. Treatment of melanin-pigmented gingiva and oral mucosa by CO2 laser. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000 Jul;90(1):14–5.

7. Hassan S, Dhadse P, Bajaj P, Subhadarsanee C: A comparison between the efficacy of scalpel and laser procedures for treating gingival hyperpigmentation: a case report. Cureus. 2022, 14:e27954

8. Elemek E: Gingival melanin depigmentation by 810 nm diode laser . Eur J Dent. 2018, 12:149-52.

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A Case Report

HEMISECTION - A RAY OF HOPE FOR THE HOPELESS TOOTH

Dr. Konthoujam Bijaya, Dr. Neetu Jindal, Dr. Renu Aggarwal, Dr. Shikha Kansra

ABSTRACT

Hemisection, is the removal of a damaged root along with corresponding section of the crown, while preserving the healthy root and its attached crown. When periodontal disease, resorption, perforation, or caries affects only one root, while the other remains largely healthy, this treatment option can be taken into account. Such procedures have a high success rate. The treatment method incorporates a combined periodontal, endodontic and prosthodontic assessment and evaluation, since in hemisection like any other treatment, appropriate case selection is the most essential component for the long-term success.

Keywords: Hemisection, Endodontic, Furcation.

INTRODUCTION

The foundation of modern dentistry is conservation. Preserving the natural state is the goal of any treatment approach, but accurate periodontal, prosthetic, and endodontic evaluation is crucial for case selection. Therefore, in cases of teeth with peri-furcation infections, root resection treatments are utilized to preserve as much tooth structure as possible, instead of opting for standard root canal therapy, which may have a delayed and/or uncertain prognosis in these situations. Extraction followed by prosthesis rehabilitation is the other therapeutic option.[1]

Hemisection, also known as root resection or the removal of a single root, is a surgical procedure where the coronal structure connected to the seriously weakened root system is purposefully excised. Even when retention of the full tooth is impossible due to advanced periodontal disease, carious lesion, or endodontic failure, a portion of a multirooted tooth can serve as a healthy abutment. Preserving the existing tooth structure and restoring function are the therapeutic goals.[2]

Weine F has outlined the following indications for root resection.[3]

Periodontal Indications

1. Significant vertical bone loss in multirooted teeth which affect just one root.
2. Destroying furcations all the way through.
3. Unfavorable proximity of the roots of neighboring teeth, hindering proper hygiene care in the areas between them.
4. Severe dehiscence-related root exposure.

Endodontic and Restorative Indications

1. Prosthetic failure of supports in a splint: When a single or multiple-rooted tooth becomes periodontally affected within a fixed bridge, the root of the affected tooth is excised if there is enough abutment support left over, rather than the bridge as a whole.
2. Endodontic failure: Hemisection is beneficial when one of the roots of a tooth with endodontia is affected, particularly in cases where there is a perforation in the pulp chamber floor or pulp canal that cannot be instrumented.
3. One root fractured vertically: There is no chance of recovery. One root may be severed if a vertical fracture passes through it without affecting the other roots.
4. Severe destructive process: During endodontic therapy, large root perforations, severe injuries, and decay in the furcation or subgingival caries can all contribute to this condition.

CONTRAINDICATIONS

a. Strong adjacent teeth can serve as alternative bridge abutments instead of hemisection.

b. Inoperable canals in the root for retention.

c. Root fusion-preventing separation.

CASE REPORT

A 21 year old male patient visited the Department of Conservative Dentistry & Endodontics, Surendera Dental College and Research Institute, Sri Ganganagar, with a primary complaint of pain in the lower right back tooth region. During intraoral examination, Deep class II caries and sensitivity to percussion wrt tooth 46.

On probing the area, a periodontal pocket was found surrounding the distal root of the tooth. After radiographic assessment of intra oral periapical, there was evidence of vertical bone loss surrounding the distal root, along with furcation involvement, while the bony support for the mesial root remained completely intact. The second molar also showed deep caries involving pulp

Fig 1: Pre operative view

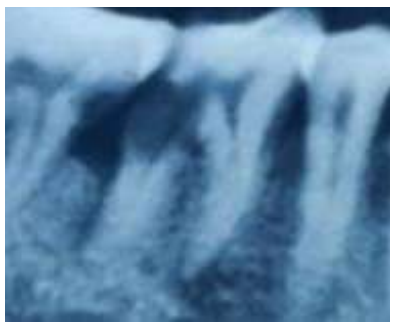

Fig 2: Pre operative radiograpgh

(Figure:1-2)

Following the tooth's endodontic therapy, we decided to remove the distal root followed by the prosthetic replacement. Before procedure, the patient was briefed on the treatment plan and their consent was obtained. Both the canal of mesial root of mandibular first molar and second molar undergo a root canal procedure, under local anesthesia and rubber dam isolation. An access cavity was created to obtain straight-line access. The working length was established using radiographic methods and verified using an apex locator. Biomechanical shaping and cleaning was done, under passive mechanical irrigation with sodium hypochlorite (3%) followed by thorough saline irrigation. The canals were dried using sterile paper points, and an intracanal calcium hydroxide dressing was applied for two weeks, which was changed at every week. The tooth was accessed again, and the calcium hydroxide was cleared using hand files along with irrigation using sodium hypochlorite. The canals were irrigated with 17% EDTA liquid and 5.25% sodium hypochlorite. Then master cone was selected and sealers with accessory cones were placed in the canals by using lateral condensation technique.

The following day, the patient was called up for the hemisection procedure. Using a long tapered fissure diamond point, the mesial and distal roots were sectioned at the furcation level, and a radiograph was obtained to ensure the complete separation. After sectioning, the mesial root was luxated and extracted from the socket using an extraction forceps, along with the coronal portion (Figure: 3-4).

Fig 3: IOPAR of extraction of distal half of tooth

Fig 4: Extracted Distal half of tooth

To get removed of bone chips, the socket was properly irrigated with normal saline solution. A finishing diamond bur was utilized to smoothen the mesial surface of the distal root and its coronal region. The extraction socket was sutured using vicryl 3-0 suture material and coated with a periodontal dressing (Coe pack) & post operative instruction were given.

Patient were asked to return after one week for evaluation. Clinical evaluation at this time revealed a healed extraction site, thus sutures were removed out and betadine irrigation was done.

The mesial portions of the mandibular first and second molar served as abutments during the crown preparation process for

porcelain fused to metal crowns. Impression was taken and die was fabricated. After 1 week the final prosthesis was placed. Fig: 5(A & B)

(A) (B)

Fig 5(A & B): Post- Operative view & IOPAR after Prosthesis

DISCUSSION

Removing one or more roots with the same coronal structure is necessary for Hemisection. When removing very compromised roots could enhance a patient's prognosis for their molar, this procedure is usually performed as an alternative to extraction.[4] Hemisection, serves as an effective alternative to extraction, to preserve multirooted teeth affected by periodontal, endodontic, restorative, or prosthetic problems. Bone loss which caused by pulpal disease is reversible, whereas, severe bone loss which caused by periodontal disease is usually irreversible.[1] This case report presents where hemisection was chosen instead of tooth extraction.

The primary argument in favor of restoring these teeth was that "fixed" teeth are typically more aesthetically acceptable and more useful than "removable" teeth.[5]

For over a century, furcation issues have been treated through reparative therapy. According to Park et al, hemisection of molars with a poor prognosis can preserve the teeth over time without causing visible bone loss. And also, it is important to evaluate the root's accessibility for simple separation and the root's remaining root's bone support.[6] According to Shafiq MK et al.'s findings, if decay is confined to a single root and the remaining portion of the tooth can function as an abutment, hemisection of a mandibular molar can be an appropriate treatment choice.[7]

Proper case evaluation is crucial for effective treatment. This technique can be utilized in cases where the root has enough bone support, but a healthy prognosis and treatment plan also depend on the root's size. Another issue to consider in determining the effectiveness of a restoration is whether the fixed prosthesis are supported by more bone than root.[8]

Hemisection may be regarded as a reliable treatment option for molar teeth that were once considered damaged if thorough case selection criteria are followed.

CONCLUSION

Effective management of endo-perio lesions requires a clear diagnosis. The current case study demonstrates how to handle these types of lesions through the application of a comprehensive therapeutic approach. The effectiveness of the hemisection surgery is largely dependent on variables including the condition of the periodontium, the restorative treatment plan, prosthetic aspects, and the patient's cooperation with maintaining oral hygiene. Maintaining periodontal health at different recall times is critical to the extracted tooth's long-term survival. Because of this, hemisection makes it possible to preserve the healthy natural tooth structure that still exists, which encourages the development of alveolar bone.

REFERENCES

1. Arora A, Arya A, Singhal RK, Khatana R. Hemisection: A conservative approach. Indian J Dent Sci 2017;9:206-9.

2. Mittal P, Prasad AB, Raisingani D, Amit, Mehta P, Soni D, Khurana D. Hemisection: A Savior for Hopeless Teeth. J Mahatma Gandhi Univ Med Sci Tech 2016;1(1):30-34.

3. Weine FS. Endodontic Therapy. 5th ed. St. Louis, USA: Mosby; 1996. p. 154-68.

4. Ng YL, Mann V, Gulabivala K. Tooth survival following non-surgical root canal treatment: A systematic review of the literature. International Endodontic Journal 2010;43:171-89

5. Saluja I, Kamath AK, Pradeep S, Gupta R, Duggal K. Hemisection: Partial preservation of compromised tooth. J Conserv Dent 2023;26:355-8.

6. Park JB. Hemisection of teeth with questionable prognosis. Report of a case with seven-year results. J Int Acad Periodontol. 2009;11(3):214-19.

7. Shafiq MK, Javaid A, Asaad S. Hemisection: An option to treat apically fractured and dislodged part of a mesial root of a molar. J Pak Dent Assoc. 2011;20:183-86.

8. Saad MN, Moreno J, Crawford C. Hemisection as an alternative treatment for decayed multirooted terminal abutment: A case report. J Can Dent Assoc 2009;75:387-90.

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A Case Report

TOOTH SUPPORTED OVERDENTURE – A CASE REPORT

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ABSTRACT

Tooth-retained overdentures are a simple and cost-effective alternative to implant overdentures. They use remaining sturdy teeth as support for the denture, boosting its stability and retention. By maintaining these teeth, bone loss is minimized, as the stresses from chewing help preserve bone. While not a cure-all, overdentures delay full tooth loss and bone resorption, offering patients satisfaction with their natural teeth still in place. This article discusses case report on overdenture with cast copings and short dowels.

Keywords : Bone preservation, bone resorption, tooth retention, cast coping, & tooth supported overdenture.

INTRODUCTION

Preventive prosthodontics highlights the importance of procedures that can delay or prevent future dental issues, with overdentures being a key preventive treatment. Patients with complete dentures often experience a series of issues, such as loss of tooth sensation, gradual bone loss, transfer of biting forces to the oral tissues, and a decline in self-confidence.

Overdentures help mitigate bone resorption, enhance the denture's foundation, and improve chewing efficiency.[1]

DeVan's principle, "Preserving what remains is more important than replacing what is missing," remains relevant. Overdentures are a superior option compared to complete removable dentures, which have notable disadvantages. They are among the most effective methods in preventive dentistry. A study by Renner et al. showed that 50% of roots used for overdenture support stayed stable over four years.[2]

According to GPT 8, overdenture is a removable partial or complete denture that covers and rests on one or more remaining natural teeth, roots, and/or dental implants; a dental prosthesis that covers and is partially supported by natural teeth, tooth roots, and/or dental implants. It is also called as overlay denture, overlay prosthesis and superimposed prosthesis.

Overdentures are suitable for patients with a few retainable teeth, misaligned ridges, single denture needs, or challenging tongue and muscle positions that affect denture stability and retention. However, they are not recommended for patients with poor oral hygiene, systemic health issues, or insufficient space between dental arches.

PROS AND CONS OF OVERDENTURES

PROS:

Overdentures help preserve alveolar bone and proprioception, improve stability and retention, and maintain the vertical dimension of occlusion.[3-6] They are beneficial for patients with congenital defects such as oligodontia, cleft palate, cleidocranial dysostosis, and Class III occlusion. Additionally, overdentures can be converted to complete dentures over time.

CONS:

Overdentures require meticulous oral hygiene to prevent caries and periodontal disease. They tend to be bulkier and can encroach on the inter-occlusal distance. This treatment is also more expensive and requires more frequent check-ups than conventional removable complete dentures.

In overdenture treatment, the remaining teeth are part of the residual ridge, offering a psychological benefit to patients by allowing them to keep their own teeth, which often outweighs the disadvantages. Retentive devices integrated into denture teeth enhance retention and support. An adequate zone of attached gingiva is essential for periodontal health with overdenture abutments.[3,4,7]

CASE REPORT – CLINICALLY + RADIOGRAPHICALY

A 60 year old female patient reported to the department of Prosthodontics including crown and bridge, Surendera Dental College and Research Institute with a chief complaint of difficulty in chewing due to missing teeth .There was no relevant medical history affecting prosthodontics treatment. Intraoral examination revealed well formed maxillary and mandibular ridges in class 1 ridge relationship. Only 33 and 43 were present in mandibular arch and radiographic examination revealed good bone support and long roots.

The different treatment options available for this patient's mandibular arch were extraction of the remaining teeth followed by conventional complete denture, implant supported overdenture and tooth supported overdenture.

The patient rejected the option of implant retained prosthesis because of the need for additional surgery, the longer duration of treatment phase and related expenditure. It was planned to construct a maxillary complete denture and a mandibular overdenture with extra coronal attachments.

TREATMENT PLAN

A preliminary assessment of the jaw relation using diagnostic casts showed that the space between the arches was sufficient for an overdenture with short copings but insufficient for a bar-supported overdenture. Following intentional root canals on teeth 33 and 43, the teeth were prepared using a tapered round-end diamond point with a subgingival chamfer finish line (Fig 1). Post preparation was done 4 mm short of the root's apex. Custom posts were created using a trimmed matchstick and pattern resin. The copings were dome-shaped, and excess resin was trimmed off.

Care was taken to ensure complete penetration into the prepared canals without air bubbles. The copings were checked for fit in the patient's mouth and cemented with glass ionomer cement (Fig 2, 3). The copings' thickness did not exceed 1 mm.

For the maxillary arch, a primary impression was made with impression compound, and for the mandibular arch, with alginate. These impressions were poured, and special trays were made using self-cure acrylic resin. Border molding was done with low-fusing compound for both arches. The final impression for the maxillary arch was made with zinc oxide eugenol, while the mandibular impression was made with regular body elastomer (Fig 4). The master casts were prepared by pouring the impressions in Type IV gypsum.

The copings on the master cast were covered with wax, and a record base was fabricated after applying a separating medium. Wax over the abutments prevented cast fracture during the removal of the temporary record base. Occlusal rims were made, and maxillomandibular relations were recorded and transferred to a semi-adjustable articulator. Teeth were set and evaluated in the patient's mouth for phonetics, vertical dimension, centric relation, and esthetics (Fig 5). After the patient's approval, the final denture was cured using heat-cure acrylic resin (Fig 6, 7).

Figure 1: Peripheral & Post Space Preparation wrt 33 & 43.

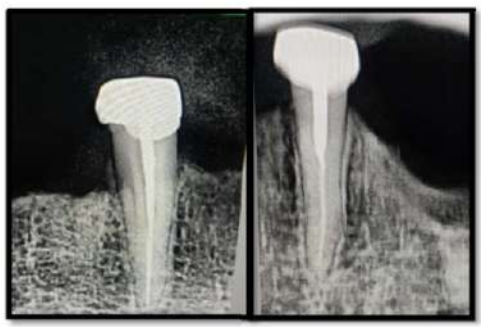

Figure 2: IOPA wrt 33 & 43 (with metal cast coping).

Figure 3: Intraoral photograph

Figure 4: Secondary Impression wrt

Figure 5: Try-in.

Figure 6: Intaglio surface of the denture

Figure 7: Intraoral view (A) Left lateral view, (B) Frontal view, & (C) Right lateral view

Figure 8: Pre-operative photographs

Figure 9: Post-operative photographs

DISCUSSION

Losing all teeth can significantly impact a patient's morale, highlighting dependence and aging. Overdentures should be a common preventive prosthodontic treatment due to their numerous benefits. Crum and Rooney's[8] five-year study showed that overdenture patients had an average vertical bone loss of 0.6 mm in the anterior mandible, compared to 5.2 mm in complete denture patients.

Miller[9] identified three factors affecting alveolar bone resorption: bone quality, individual health, and trauma to the structures. Overdentures help reduce bone shrinkage and alleviate pressure on the alveolar ridge. They also maintain proprioception[6] and enhance directional sensitivity, dimensional discrimination, canine response, and tactile sensitivity. Denture wearers have a tenfold increase in sensitivity to load compared to patients with natural teeth.

Rissin et al. (1978) found that overdenture patients had a 33% higher chewing efficiency than complete denture patients. Overdentures with attachments can distribute occlusal forces away from weak abutments or toward stronger ones, improving retention. Attachments, such as studs or bars, connect the prosthesis to the teeth and are classified as rigid or resilient.

Resilient attachments, like the metal O-ring system, are preferable for compromised ridges and roots. For cases with limited inter-arch space, customized small coping with an intraradicular post is ideal.[10]

Although implants are now common, tooth-supported overdentures remain a viable option, depending on the proper attachment selection. Factors include available space, bone support, opposing dentition, clinical experience, maintenance issues, cost, and patient motivation. Strategic abutment selection and patient attitude are crucial for success. Only patients who understand the benefits and limitations should receive attachment-retained overdentures, making careful patient selection essential.

REFRENCES

1. Renner RP, Gomes BC, Shakun ML, Baer PN, Davis RK, Camp P. Four-year longitudinal study of the periodontal health status of overdenture patients. J Prosthet Dent 1984;51:593-98.

2. Dhir RC. Clinical assessment of overdenture therapy. J Indian Prosthodont Soc 2005;5:187-92.

3. Morrow RM, Feldmann EE, Rudd KD, Trovillion HM. Tooth-supported complete dentures: An approach to preventive prosthodontics. J Prosthet Dent 1969;21:513-22.

4. Morrow RM, Rudd KD, Birmingham FD, Larkin JD.

Immediate interim toothsupported complete dentures. J Prosthet Dent 1973;30:695-700.

5. Dodge CA. Prevention of complete denture problems by use of "overdentures". J Prosthet Dent 1973;30:403-11.

6. Thayer HH. Overdentures and the periodontium. Dent Clin North Am 1980;24:369- 77.

7. Brewer AA, Morrow RM. Overdentures Made Easy. 2nd ed. St. Louis: The C. V. Mosby Co.; 1980.

8. Crum RJ, Rooney GE Jr. Alveolar bone loss in overdentures: A 5-year study. J Prosthet Dent 1978;40:610-13.

9. Miller PA. Complete dentures supported by natural teeth. Tex Dent J 1965;83:4-8.

10. Rissin L, House JE, Manly RS, Kapur KK. Clinical comparison of masticatory performance and electromyographic activity of patients with complete dentures, overdentures, and natural teeth. J Prosthet Dent 1978;39:508-11.

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A Case Report

RADICULAR CYST EARLY DIAGNOSIS AND TREATMENT - A CASE REPORT

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ABSTRACT:

Periapical cyst is the most common inflammatory odontogenic cyst caused by an infected tooth, leading to necrosis of the pulp, which often leads to periapical inflammation[1]. Other causes include tooth fracture, improper restoration. The highest incidence is in the 3rd and 4th decades.[2] Males are more affected commonly than females[3]. Most cases of Radicular cyst are asymptomatic and they are diagnosed accidentally during routine radiographic examination. This article presents a case report of 60 years old male with an apical periodontal cyst. Early diagnosis and treatment planning is necessary. This article signifies the role of surgeon in early diagnosis and treatment plan of cyst.

INTRODUCTION:

A cyst is a pathological cavity filled with fluid or semifluid material or gases contain which may or may not be lined by epithelium but not created by the accumulation of pus[2]. Cysts are classified as developmental or odontogenic. Periapical cyst is odontogenic in origin. These cysts are the most common cysts of the jaws that can be caused from a pre-existing periapical granuloma, a focus of chronically inflamed granulation tissue located at the apex of non-vital tooth[5]. These cysts are usually asymptomatic and are discovered incidentally during routine dental radiographic examinations.[3] This cyst arises from the rests of Malassez, which enlarge in response to inflammation elicited by bacterial infection of the pulp or in direct response to necrotic pulpal tissue[6]. Because epithelial cells derive their nutrients by diffusion from the adjacent connective tissues, progressive growth of an epithelial island moves the innermost cells of that island away from their nutrients. Ultimately these innermost cells undergo ischemic liquefactive necrosis, establishing a central cavity (lumen) surrounded by viable epithelium[3]. At this point an osmotic gradient is established across the epithelial lining (membrane) separating the connective tissue fluids from the necrotic contents of the newly formed cyst[4]. The net effect of this osmotic gradient is a progressive increase in fluid volume within the lumen, tending to expand the cyst by the internal hydraulic pressure generated[5,6].

CASE REPORT:

A 60-year-old male patient reported to the Department of Oral and Maxillofacial Surgery presenting symptoms of pain, swelling and pus discharge in upper right front teeth region from 1 month. Patient reported that he visited local dentist before for extraction, but didn't get relieved, there he also had composite laser treatment over swelling there but swelling didn't reside. There was gross facial asymmetry (Fig 1,2). Intra-oral examination showed: Missing of 11 15 18 22 25 27 28 34-38 and 44-46 48. Swelling extending from 11 to 14. Swelling was soft to firm, non-tender, immobile with labial obliteration. (Fig-3)

Aspiration was carried out which showed straw coloured fluid (Fig-4). Vitality test of the entire maxillary teeth was carried out and which showed no response. Radiographic examination demonstrated well-defined radiolucency involving apices from 12 to 14 (Fig-5). Provisional diagnosis of radicular cyst was made and planned for enucleation along with extraction of 12,13 under local ansthesia .

Crestal incision was given extending from 11 to 15 region using no. 15 BP blade. Full thickness mucoperiosteal flap was raised and cystic lining and bony defect was seen. Entire cystic lining curettage and removed in toto (Fig 6,7). Thorough irrigation was done using betadine and normal saline. Cystic cavity was packed with iodoform and paraffin dressing and primary closure was done using 3-0 silk suture (Fig-8). Cystic lining send for histopathological examination. Histopathological examination (Fig 10-11) revealed cystic capsule overlaying lumen .The lumen was lined by stratified squamous epithelium which was showing arcading pattern due to epithelial hyperplasia. The overlaying capsule stroma showed presence of dense collagen fibres with chronic inflammatory cells, foamy cells and endothelial lined blood vessels. Correlating the overall features, a final diagnosis of Radicular cyst was made .(Fig 9-10)

Fig 1 – Front profile of the patient showing facial asymmetry

Fig 2 lateral profile (Right Side)

Fig 3 - Intraoral examination showing null defined swelling

Fig 4 - Aspiration of cystic fluid

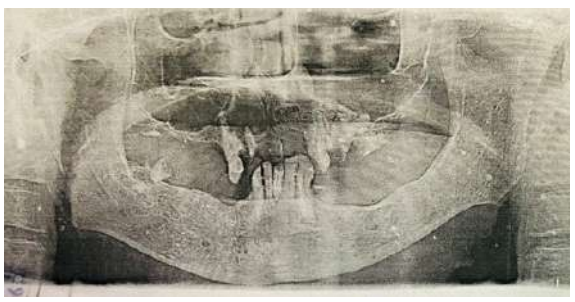

Fig 5 - Radiographic Examination-OPG Showing well defined radiolucency involving apices from 12-14

Fig 6- Cyst Enucleation

Fig- 7 Cystic Cavity

Fig- 8 3-0 Silk Sutures placed

7th day follow up

HISTOPATHOLOGICAL SLIDE:

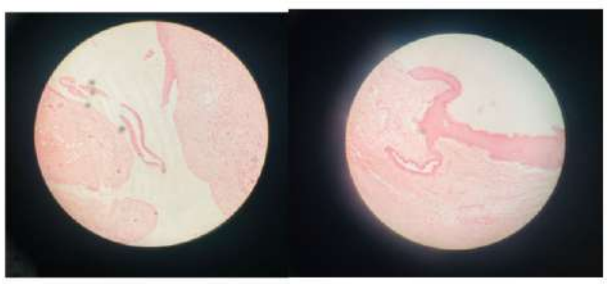

Fig- 9 Histopathological slide 1

Fig- 10 Histopathological slide 2

DISCUSSION:

A periapical cyst, also known as a radicular cyst, is the most common type of odontogenic cyst, often found at the apex of a non-vital tooth in the maxilla or mandible[1]. It typically arises as a result of chronic inflammation or infection within the pulp of a tooth, which leads to the formation of a cystic lesion due to the proliferation of epithelial cells in the periapical region[7]. The lesion is typically asymptomatic, especially in its early stages, and may only be discovered incidentally during routine radiographic examinations. Clinically, patients may present with swelling or a dull ache in the affected region, although in many cases, there are no visible symptoms until the cyst has reached a larger size, potentially causing facial deformity[8].Radiographically, a periapical cyst is characterized by a well-defined, round or oval radiolucent area at the apex of a non-vital tooth[9]. It can often be confused with other periapical lesions, such as periapical granulomas or odontogenic tumors, necessitating careful diagnosis and differentiation through histopathological examination. The definitive diagnosis is generally made by the microscopic evaluation of the cystic lining, which often consists of non-keratinized stratified squamous epithelium, and the presence of a dense chronic inflammatory infiltrate in the surrounding tissue.Treatment of periapical cysts typically involves the removal of the cyst along with the associated non-vital tooth, followed by curettage of the cystic cavity to prevent recurrence. In some cases, endodontic treatment of the affected tooth followed by monitoring may be an appropriate approach if the lesion is small and the tooth can be preserved. If the cystic lesion is extensive, surgical enucleation and bone grafting may be necessary to restore the anatomical structure of the maxilla[10].Although the prognosis after treatment is generally favorable, with the resolution of the cyst and healing of the surrounding bone, the recurrence rate may increase in cases of incomplete enucleation or persistent infection[7]. Therefore, careful follow-up is crucial to monitor for any signs of recurrence. Furthermore, early detection and treatment are essential in preventing complications such as expansion of the cyst, infection, and involvement of adjacent structures. In rare cases, periapical cysts can undergo malignant transformation, highlighting the importance of long-term monitoring even after successful treatment.

CONCLUSION:

The present case reported was found to contain large size periapical cyst. It was managed successfully by conservative surgical enucleation which involves the removal of the infected lesions along with the surrounding healthy tissue, followed by iodoform pack with good prognosis. Harrison & Jurosky state that if lesion is small then all pathological tissue can easily be removed,if lesion is large then it is more likely that curettage will be incomplete and thus unsuccesful.The prognosis for a periapical lesion depends on its type and radiographic size with cysts & larger lesions have worst evaluation. Radicular cysts are common yet often unnoticed oral conditions, potentially affecting both primary and permanent dentition. Close post-surgery follow-up is advisable, for bone regeneration purposes.

REFERENCES:

1. Shafer's Textbook of Oral Pathology, 7th Edition, 2012:273

2. Neelima Anil Mlik Textbook of Oral and MaxillofacialSurgery, 4th Edition, 2016:649

3. Shear M. Cysts of the Oral Regions, 3 edtion, Boston, Wright, 1992 .pp. 136-70

4. Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology, 2nd edition, Philadelphia, W.B. Saunders; 2002.pp. 107-36.

5. Nair PN. New perspectives on radicular cysts: do they heal? Int Endod J. 1998; 31: 155-160.

6. Weber AL. Imaging of cysts and odontogenic tumors of the jaw. Definition and classification. Radiol Clin North Am. 1993; 31: 101-120.

7. Killey HC, Kay LW, Seward GR. 3rd edn. Edinburgh and London Churhill Livingston 1977

8. Nair PN. New perspectives on radicular cysts: do they heal? Int Endod J. 1998; 31: 155-160.

9. Lin LM, Wang SL, Wu-Wang C, Chang KM, Leung C. Detection of epidermal growth factor receptor in inflammatory periapical lesions. Int Endod J. 1996; 29: 179-184.

10. Raggatt LJ, Partridge NC. Cellular and molecular mechanisms of bone remodeling. J Biol Chem. 2010; 285: 25103-25108

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A Case Report

MULTIDISCIPLINARY APPROACH IN MANAGEMENT OF ENDOPERIO LESION : A CASE REPORT

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ABSTRACT

Lesions emerging from inflammatory chemicals that are present in both the pulpal and periodontal tissues to varying degrees are referred to as "endo-perio" lesions. When inflammatory periodontal disease and pulpal infections occur at the same time, diagnosis and treatment planning may become more difficult. Each type of endodontic-periodontal disease has a different prognosis and course of therapy. Both endodontic and periodontal treatments are required for primary periodontal disease with secondary endodontic involvement and true combined endodontic-periodontal disorders. Depending on how severe the periodontal disease is and how well the patient responds to treatment, these situations will have different outcomes. In this case study, a 36-year-old male patient who had been complaining of pain for a month in the right lower back tooth area of the jaw is successfully treated. Dental examination revealed tooth 46 to be restored. Radiolucency including the periapical area and furcation was found on radiographic evaluation with regard to 46. Regarding 46, the treatment plan included for an RCT, periodontal surgery, and a crown.

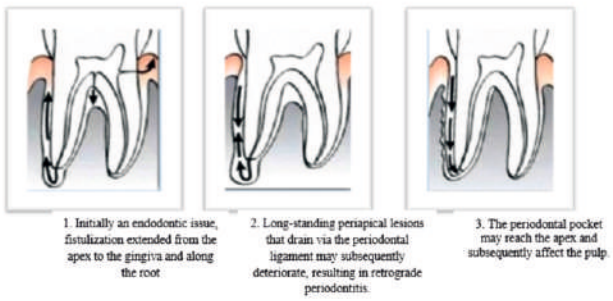
Keywords: endodontic-periodontal lesions, furcation involvement, root resoprtion

INTRODUCTION:

Because the endodontium and periodontium are closely connected tissues, diseases that affect one may also affect the other. Differentiating between periodontal and endodontic infections can occasionally be challenging, but receiving the appropriate treatment depends on making the correct diagnosis. Endodontic-periodontal illnesses present challenges for the dentist in terms of diagnosis and treatment plans for the affected teeth. In addition to etiologic factors including bacteria, fungi, and viruses, dental abnormalities, trauma, root resorptions, perforations, and other contributory variables play a significant role in the development of these disorders. Endo-perio lesions are caused by the presence of periodontal and pulpal diseases in the same tooth root.[1] The link between periodontal and pulpal disorders was first documented in 1964 by Simring and Goldberg.[2]

Simon, Glick, and Frank (1972) Classification of endodontic-periodontal lesions[3,4]

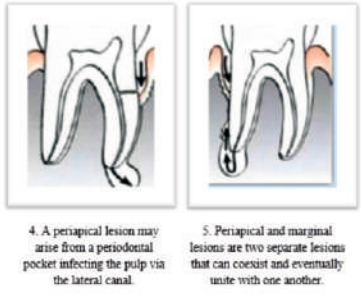
1. Primary endodontic lesions
2. Primary periodontal lesions
3. Primary periodontal lesions with secondary endodontic involvement
4. Primary endodontic lesions with secondary periodontal involvement
5. True combined lesions



1. Initially an endodontic issue, fistulization extended from the apex to the gingiva and along the root

2. Long-standing periapical lesions that drain via the periodontal ligament may subsequently deteriorate, resulting in retrograde periodontitis.

3. The periodontal pocket may reach the apex and subsequently affect the pulp.



4. A periapical lesion may arise from a periodontal pocket infecting the pulp via the lateral canal.

5. Periapical and marginal lesions are two separate lesions that can coexist and eventually unite with one another.

CASE REPORT:

A male patient, age 36, presented himself to the Surendera Dental College's conservative dentistry and endodontics department in Sriganganagar with the chief complaint was of pain in the lower right back tooth region since one month and gave a history of restoration for 5 years back in 46. On intraoral examination, there was a faulty restoration wrt 46. Investigations IOPA of 46 reveal radiolucency involving the furcation and periapical area (Fig.1). Diagnosed primary endo and secondary perio lesion with respect to 46.

Treatment plan: RCT followed by periodontal surgery followed by crown wrt 46.

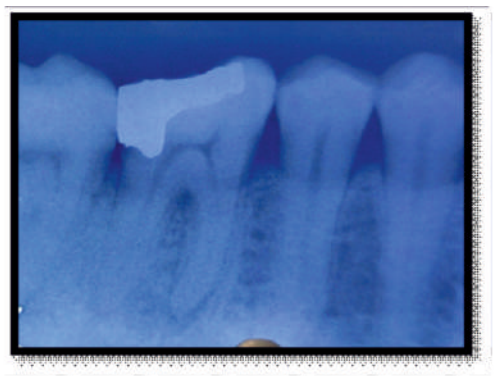


Fig 1: Preoperative radiograph

A concerted approach was used to treat tooth 46, consisting of both endodontic and periodontal treatment procedures. The anti-infective therapy (phase 1 therapy) aimed to lower inflammation and the bacterial load. The patient received personalized oral hygiene instructions as part of an oral prophylaxis session. The root canal procedure was started on the first visit while the patient was sedated and kept isolated with a rubber barrier. An access cavity was created with an endo-access bur, and #10 K hand files were used to ensure canal patency. The working length was determined with the help of 15 no. k-file (Fig.2), and circumferential was done up to 25 no. k-file. A copious saline and sodium hypochlorite (3%) irrigation was done during each instrumentation change. After dressing the canals with calcium hydroxide for seven days and drying them with sterile paper tips, the tooth was temporarily restored.

Fig 2: Working length determination

The tooth was reaccessed at the second appointment, and calcium hydroxide was extracted with hand files and sodium hypochlorite irrigation. Both the 17% EDTA liquid and the 5.25% sodium hypochlorite, which were activated with Endo Activator, were used to irrigate the canals. Next, the master cone was chosen (Fig.3), and the lateral condensation technique was used to obturate the canals (Fig.4).

Fig 3: Master cone determination

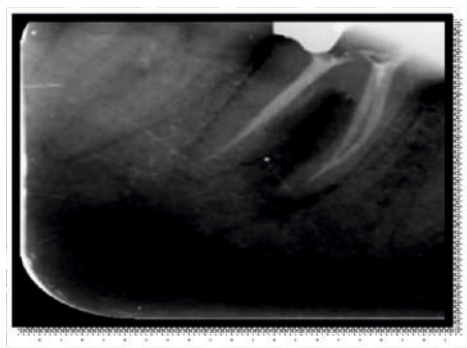


Fig 4: Obturation

During the surgery, full-thickness flaps were elevated with sulcular incisions one tooth mesial and distal to the surgical sites under local anesthesia. After removing the granulation tissue, careful scaling and root planing were carried out. Allogenic demineralized cortical particulate bone graft was hydrated with PRF exudate. The furcation region and intrabony defect were filled with chopped PRF and bone graft mixes. The roots of the grafts were wrapped in PRF membrane. The flap was coronally advanced using horizontal mattress sutures, and the main closure was achieved with numerous single interrupted sutures.

The patient was instructed to rinse with chlorhexidine for 4 weeks after surgery with no brushing or flossing at the surgical site. The sutures were removed at a 2-week postoperative appointment. After 4 weeks, brushing and flossing resumed, and oral hygiene was improved.

Fig. 5 Incision

Fig. 6 after root planning

Fig. 7 Suture given

Fig. 8 Post operative radiaograpgh after one month

DISCUSSION:

This case study shows that even with a dismal prognosis, a tooth can be saved if treatment is coordinated and multidisciplinary. The patient's compliance, good dental hygiene, and the tooth's restorability were the fundamental criteria that led to the choice to save the tooth rather than extract it.

The long-term results of RCT and restoration with implant-supported single crowns (ISC) and fixed partial dentures (FPD) were compared in a systematic study, which found that the long-term survival of RCT and ISC was better than that of FPD. Setzer and Kim'S in their recent study showed that whereas endodontically treated teeth and implants had similar survival rates, the success rates might not equal. Seven to nine years later, the success rate for implants was 74%, while the success rate for teeth treated with endodontics was 84%. Furthermore, the group with implants saw noticeably greater rates of problems. Moreover, survival occurred in 17.9% of implant instances compared to only 3.6% of endodontic cases because problems were managed.[5]

In order to promote healing, the anti-infective therapy aimed to reduce the bacterial load and create a balance between the bacterial burden and the host response. It was therefore essential that the therapy involve endodontic treatment first, followed by periodontically, due to the endodontic-periodontic lesion at the lower right first molar. Vakalis and colleagues showed that nonsurgical periodontal therapy followed by RCT can be highly beneficial in improving clinical parameters and promoting alveolar bone growth.[6]

According to Cortellini et al., regenerative periodontal therapy can be used as an alternative to extraction even for teeth that are in terminal condition. When uncertain and hopeless teeth are enmeshed in a systematic and subsequent maintenance program, together with high patient compliance, they can be kept for a long time. Patients who adhere to routine periodontal maintenance visits lose fewer teeth and suffer less attachment loss than patients who receive insufficient periodontal care, according to multiple studies, maintaining the treatment outcome.[7]

The apical foramen is the primary point of contact between the periodontal and pulpal tissues in endodontic-periodontal diseases so any inflammation of the pulpal tissue may spread into the periapical tissue from the apical foramen. This usually causes localized inflammation around the periapex, which is linked to bone resorption.[8]

CONCLUSION:

In order to attain health, comfort, esthetics, and function even in teeth with periodontic-endodontic lesions of primary periodontal origin, this case study shows that a coordinated interdisciplinary approach can lead to improving and retaining the natural dentition. Making the right diagnosis is crucial to the treatment's success. Therefore, only appropriate endodontic therapy combined with long-term follow-up will result in a complete resolution of the lesion if it has an endodontic origin.

REFERENCES

1. Nina S, Arvind S.Endo-perio lesions: Diagnosis and clinical considerations. Indian J Dent Res.2010:21(4):579-585

2. Simring M, Goldberg M. The pulpal pocket approach: retrograde periodontitis. J Periodontol 1964; 35: 22-48

3. Simon JH, Glick DH, Frank AL. The relationship of endodontic-periodontic lesions. J Periodontal 1972 ;43: 202-208

4. DeSanctis M, Murphy KG. The role of resective periodontal surgery in the treatment of furcation defects. Periodontol 2000. 2000;22:154-168

5. Seltzer S, Bender IB, Nazimov H, and Sinai I. Pulpitis induced interradicular periodontal changes in experimental animals, J Periodontal 1967; 38:124–129.

6. Vakalis SV, Whitworth JM, Ellwood RP, Preshaw PM A pilot study of treatment of periodontal-endodontic lesions.

International Dental journal.2005; 55: 313-318

7. Cortellini P, Stalpers G, Mollo A, and Tonetti MS. Periodontalre generation versus extraction and prosthetic replacement of teeth severely compromised by attachment loss to the apex: 5-year results of an ongoing randomized clinical trial. J Clinical Periodontal 2011. 38. 915–924.

8. Jakovljevic A, Miletic M, Nikolic N, Beljic-Ivanovic K, Andric M, Milasin J. Notch signaling pathway mediates alveolar bone resorption in apical periodontitis. Med Hypotheses 124:87–90.2019

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A Case Report

MANAGEMENT OF LIMITED INTERARCH SPACE CASE WITH AID OF SCREW RETAINED PROSTHESIS: A CLINICAL REPORT

Dr. Kartik Sokhal, Dr. Sandeep Kumar, Dr. Rajnish Aggarwal, Dr. Jaspinder Kaur, Dr. Bhavna Thoidingjam

ABSTRACT

Screw-retained implant crowns have become a popular choice for restoring missing teeth due to their retrievability, ease of maintenance, and potential for long-term stability. However, challenges arise when dealing with limited interarch space, which may compromise the proper placement and angulation of implants and abutments, as well as the fabrication of the prosthetic restoration.

This case study presents the successful rehabilitation of a patient with limited interarch space using a screw-retained implant crown. A 52-year-old male presented with a missing maxillary left premolars and molars and insufficient interarch space due to supra eruption of mandibular molars. After thorough examination and treatment planning, a minimally invasive approach was adopted to create adequate space for implant placement.

Utilizing imaging techniques, including orthopantogram (OPG), precise measurements of available bone and interarch space were obtained. Implant placement was carefully planned to ensure proper alignment and angulation within the limited space. Additionally, customized abutments with reduced height were fabricated to optimize the prosthetic design and minimize the vertical dimension of the restoration.

The final screw-retained implant crown was fabricated using computer-aided design and manufacturing (CAD/CAM) technology to achieve precise fit and esthetics along with abutment supported prosthesis. Despite the challenges posed by limited interarch space, the prosthesis was successfully placed with optimal function and esthetic outcomes. Moreover, the screw-retained design facilitated ease of maintenance and potential future adjustments if needed.

This case highlights the importance of meticulous treatment planning and interdisciplinary collaboration to overcome the challenges associated with limited interarch space in implant dentistry. By employing innovative techniques and customized solutions, screw-retained implant crowns can offer reliable and aesthetic restorations even in complex clinical scenarios.

Keywords: screw-retained implant crown, limited interarch space, dental implant, treatment planning, CAD/CAM technology, interdisciplinary collaboration.

INTRODUCTION

The restoration of missing teeth using dental implants has revolutionized modern dentistry, offering patients reliable solutions for functional and aesthetic rehabilitation.[1] Among the various techniques available, screw-retained implant crowns have gained popularity due to their advantages in retrievability, ease of maintenance, and long-term stability.[2]

However, the successful application of screw-retained prostheses can be challenged by anatomical constraints, particularly limited interarch space.[3] Limited interarch space poses unique challenges in implant dentistry, often requiring careful treatment planning and innovative solutions to achieve optimal outcomes.[4] Factors such as tooth crowding, inadequate bone volume, and unfavorable angulation can complicate the placement and restoration of implants, affecting both function and esthetics.[5]

Addressing these challenges demands a thorough understanding of biomechanical principles, advanced imaging technologies, and interdisciplinary collaboration among dental specialists.[6] In this context, this case study presents a comprehensive approach to restoring a missing tooth in a patient with limited interarch space using a screw-retained implant crown.

Through meticulous treatment planning, precise surgical techniques, and customized prosthetic solutions, the clinical team aimed to overcome the anatomical constraints and deliver a functional and aesthetic restoration.[7] The case underscores the importance of interdisciplinary collaboration between oral surgeons, prosthodontists, and dental laboratory technicians in addressing complex clinical scenarios.[8] Furthermore, it highlights the integration of advanced imaging modalities, such as computer-aided design and manufacturing (CAD/CAM) technology, to optimize treatment outcomes.[9]

By sharing this case, we aim to contribute to the understanding of implant dentistry in challenging anatomical conditions and provide insights into the clinical strategies employed to achieve successful outcomes. Ultimately, the goal is to empower

clinicians with knowledge and tools to navigate complex cases and deliver high-quality implant restorations that meet the unique needs of each patient.

CASE REPORT CLINICALLY AND RADIOGRAPHICALLY

A 52 -year-old male patient reported to the Department of Prosthodontics including crown and Bridge, Surendera Dental College & Research Institute with a chief complaint of difficulty in mastication due to missing teeth and less inter arch space in left side. Patient was presented with two different treatment modalities which included removable prosthesis i.e., removable denture and fixed prosthesis which included implant supported prosthesis. The patient expressed a desire for fixed prosthesis and after clinical evaluations and bone assessment. A detailed treatment plan was discussed and prosthodontic opinions were also considered 3 IMPLANTS were planned, in sites # 24, 26, 27[Fig. 2]

After 6 months, patient reported back to department for prosthesis for edentulous area. Due to less interarch space implant supported prosthesis planned from region 24 to 26 whereas screw retained prosthesis planned for region 27. (Fig. 1,2)

The following step were followed:

• 2nd surgery is done at site #24, 26, 27

• Impression made for implant # 24, 26, 27 along with straight abutment selection #24 and 26. Diagnostic cast is fabricated and scanned for interocclusal record (Fig. 3)

• After that (CAD/CAM) technology was used to fabricate implant supported prosthesis for 24 to 26 region whereas screw retained prosthesis fabricated in 27 due to less inter-arch space. (Fig. 4)

• Finally, prosthesis wrt 24 to 26 was cemented and screw retained prosthesis wrt 27 is delivered to patient. (Fig. 4,5)

Fig. 1 : Preoperative intra-oral view

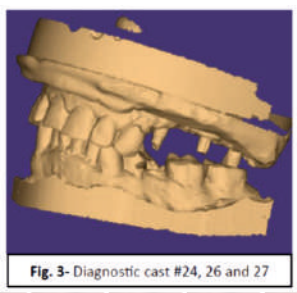

Fig. 3- Diagnostic cast #24, 26 and 27

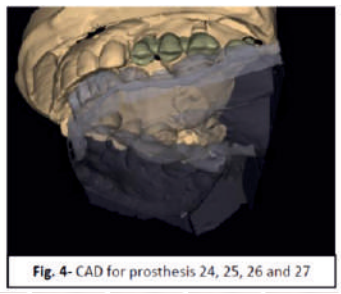

Fig. 4- CAD for prosthesis 24, 25, 26 and 27

Fig. 5- post operative intraoral view

DISCUSSION :

When considering implant-supported crowns for cases with limited interarch space, both screw-retained and cement-retained options offer distinct advantages and considerations. Screw-retained crowns are advantageous due to their minimal vertical height requirement. This feature allows for easier fabrication and placement, especially in posterior regions where space is often constrained. Additionally, the screw-retained design facilitates retrievability, simplifying maintenance and potential future adjustments. However, screw-retained crowns may require careful management of occlusion to avoid excessive stresses on the implant and surrounding structures. They also entail potential challenges during fabrication and placement, such as ensuring precise alignment of the access hole.

On the other hand, cement-retained crowns offer simplicity in fabrication and placement, making them suitable for cases where space limitations may pose challenges for screw-retained options. Their lack of an access hole provides greater flexibility in managing occlusion and achieving optimal esthetics. However, cement retention may present difficulties in retrievability and maintenance, as the restoration must be dislodged to access the implant screw. Moreover, excess cement residue can contribute to peri-implant complications if not meticulously removed.

Ultimately, the choice between screw-retained and cement-retained crowns for cases with limited interarch space should be

made based on careful consideration of the patient's anatomical factors, esthetic goals, occlusal requirements, and long-term maintenance needs.

REFERENCES

1. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. Int J Oral Maxillofac Implants. 1986;1(1):11-25.

2. Jemt T. Failures and complications in 391 consecutively inserted fixed prostheses supported by Brånemark implants in edentulous jaws: a study of treatment from the time of prosthesis placement to the first annual checkup. Int J Oral Maxillofac Implants. 1991;6(3):270-276.

3. Tarnow DP, Emtiaz S, Classi A. Immediate loading of threaded implants at stage 1 surgery in edentulous arches: ten consecutive case reports with 1- to 5-year data. Int J Oral Maxillofac Implants. 1997;12(3):319-324.

4. Albrektsson T,. State of the art in oral implants. J Clin Periodontol. 1991;18(6):474-481.

5. Misch CE. Contemporary Implant Dentistry. 3rd ed. St. Louis, MO: Mosby Elsevier; 2008.

6. Jaffin RA, Berman CL. The excessive loss of Branemark fixtures in type IV bone: a 5-year analysis. J Periodontol. 1991;62(1):2-4.

7. Zinsli B, Sagesser T, Mericske E, Mericske-Stern R. Clinical evaluation of small-diameter ITI implants: a prospective study. Int J Oral Maxillofac Implants. 2004;19(1):92-99.

8. Buser D, Mericske-Stern R, Bernard JP, et al. Long-term evaluation of non-submerged ITI implants. Part 1: 8-year life table analysis of a prospective multi-center study with 2359 implants. Clin Oral Implants Res. 1997;8(3):161-172.

9. Jemt T, Lekholm U. Implant treatment in edentulous maxillae: a 5-year follow-up report on patients with different degrees of jaw resorption. Int J Oral Maxillofac Implants. 1995;10(3):303-31

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A Case Report

BILATERAL UPPER LIP SWELLING WITH ANTERIOR MAXILLARY VESTIBULAR ABSCESS—DIAGNOSTIC, THERAPEUTIC AND SURGICAL CHALLENGES

Dr. Astha Bhatt , Dr. Manisha Solanki, Dr. Pooja Jaiswal, Dr. Hrushikesh Sonawane

ABSTRACT

This paper presents a case report of a 24 years old female patient with bilateral upper lip swelling and pain which was diagnosed early, managed conservatively and treated surgically.

As the swelling presenting in central upper lip region so various differential diagnosis was made which includes allergic reaction, periodontal abscess, and periapical abscess extending in dangerous area of the face.

A Periapical abscess is a localized collection of pus at the apical region of the tooth, usually resulting from an infection that has spread from the pulp of the tooth. It typically occurs when bacteria invade the dental pulp through a cavity. The infection can lead to inflammation, pain, swelling, and sometimes even the formation of an abscess.

Treatment usually involves draining the abscess to remove the pus, along with antibiotics to clear the infection. In some cases, a root canal treatment may be necessary to remove the infected pulp and save the tooth. If left untreated, a Periapical abscess can lead to serious complications, including the spread of infection to other parts of the body. Regular dental check-ups and good oral hygiene can help prevent Periapical abscesses.

Hereby we are presenting a case report on 24 year old female patient with swelling on upper lip region and pain which was diagnosed with periapical abscess.

Keywords- periapical abscess, dangerous area of the face, periodontal abscess, upper lip swelling

INTRODUCTION

The pulp is the innermost part of a tooth, containing nerves, blood vessels, and connective tissue. When bacteria penetrate the pulp, typically through untreated dental decay or trauma, it can lead to pulpitis, which is inflammation of the pulp.

If left untreated, the bacterial infection can progress further through the root canal system and reach the tip of the tooth's root, where it can cause a Periapical abscess. This abscess is a localized collection of pus that develops in response to the infection, usually at the apex (tip) of the root.

A Periapical abscess is also known as a dental abscess or tooth abscess. It develops as a result of bacterial infection, often originating from dental decay or damage that allows bacteria to enter the inner pulp chamber of the tooth. The infection can cause severe pain, swelling, and tenderness in the affected area. without treatment, the abscess can spread to surrounding tissues and lead to more serious complications like Cavernous Sinus Thrombosis. Treatment typically involves draining the abscess, cleaning the affected area, and addressing the underlying cause, which may include root canal therapy or tooth extraction. Antibiotics may also be prescribed to help control the infection.

CASE REPORT

A 24-years-old Female patient reported to Department of Oral and Maxillofacial surgery presenting symptoms of pain and swelling in upper front teeth region (Fig1) since 2 days. Patient mentioned that she experienced pain for the first time one year back for which she visited to a local clinic 4 months before where some restoration was done in the upper front teeth. After that she got relieved. Then she started experiencing pain in the same region 2 days back with the swelling noticed a day ago. On reporting nature of the pain was found to be mild and continuous which increases while chewing or clenching of mouth and not get any relief by medication. On general examination patient was found to be well nourished, cooperative and all vitals were within normal limit. There was gross facial asymmetry and extraoral swelling present on the upper lip region involving philtrum extending from vermillion border of the upper lip to ala of the nose (superioinferiorly) and from nasiolabial fold to philtrum (anterioposteriorly) approximately 2x3 cm in size, ovoid in shape. Skin over the swelling was red in colour, stretched, shiny, and without any discharge (Fig2). Intraoral examination (Fig3) showed a diffused swelling on upper front region extending from 12 to 22 region involving the attached gingiva, obliterating the buccal vestibular sulcus depth, approximately 1.5x3 cm in size,

red in colour with no draining sinus present. Patient has faulty restoration in cervical part of 11 and 21 and on percussion 11 and 21 were non tender. Vitality testing was done wrt 11, 12, 21, and 22 and among them 11 and 21 were non vital and normal response was present wrt 12 and 22. Aspiration was carried out which shows pus with blood. Radiographic examination (Fig4) demonstrated radiolucency involving apices of 11 and 21. Diagnosis of periapical abscess was made, so planned for incision and drainage along with root canal treatment of offending teeth.

Under the IV antibiotic coverage (amoxicillin and potassium clavulanic acid and metronidazole) followed by the root canal treatment wrt 11 and 21, incision and drainage was done by Hilton`s method. Under Local anesthesia vestibular incision was given extending from 11-21 (Fig5). Pus drainage was done by mosquito forceps using Hilton`s method (Fig6). Thorough irrigation was done using normal saline and Betadine. Solution. Corrugated rubber drain was placed and secured with 3-0 silk suture (Fig 7, 8). IV Antibiotics were prescribed for 3 days followed by oral antibiotics for 5 days and warm saline rinses. After 5 days corrugated drain removed (Fig9). Patient was kept on regular follow ups after approximately one month (Fig10) satisfactory healing was present with no swelling and pain

Fig 1 Lateral profile of patient

Fig 2 Front profile of patient

Fig 3 Vestibular Swelling wrt 11,12,21 and 22

Fig 4 OPG showing periapical radiolucency wrt 11, 21

Fig 5 Vestibular Incision

Fig 6 Pus Drainage using Hilton's method

Fig 7 Corrugated rubber drain placement

Fig 8 Suture placement and securing the drain

Fig 9 Follow up 5th day

Fig 10 Follow up 1 month

DISCUSSION:

Infections of orofacial and neck region, particularly those of odontogenic origin, have been one of the most common diseases in human beings. Despite great advances in healthcare, these infections remain a major problem; quite often faced by oral and maxillofacial surgeons. These infections range from Periapical abscess to superficial and deep neck infections. The infections generally spread by following the path of least resistance through connective tissue and along facial planes. The infections spread to such an extent, distant from the site of origin, causing considerable morbidity and occasional death. Early recognition of orofacial infection and prompt, appropriate therapy is absolutely essential. The main cause of Periapical abscess is infective necrosis of the pulp. Clinical features includes severe throbbing pain, where the offending tooth may show carious environment. Mobility of the tooth may or may not be present. Treatment consists of supportive care-hydration, soft or liquid diet rich with high protein, analgesics and use of antiseptic mouthwashes to maintain the oral hygiene. Methods of drainage of pus through the root canal treatment, through the socket of extracted tooth, through fenestration of the alveolar bone. Hilton's method of incision and drainage is used where the method of opening of an abscess ensures that no blood vessel or nerve is in the vicinity is damaged.

The periapical abscess of upper anterior teeth as presented in this case report highlights the common clinical challenges of managing infections in the anterior dental region which can present with both acute and chronic symptoms.This case offers an opportunity to reflect on pathophysiology, clinical management and patient compliance associated with peripheral abscess particularly those involving maxillary anterior teeth. The anterior maxillary region characterized by its proximity to vital structures such as nasal cavity sinuses orbit can pose particular challenge in both diagnosis and treatment[7]. In this case the periapical abscess was likely precipitated leading to pulp necrosis, and subsequent bacterial invasion of periapical tissue. A key consideration in treatment of periapical abscess in anterior teeth is the cosmetic and functional outcome, particularly given the aesthetic concerns associated with upper anterior region.

CONCLUSION

The present case report was found to contain upper lip swelling due to periapical abscess delaying which can lead to space infections or in some cases can be fatal due to its presence in the dangerous area of the face region.The case was diagnosed early , managed successfully and conservatively showing good follow up results.

REFERENCES

1. Shafer's Textbook of Oral Pathology, 7th edition, 2012:273

2. Neelima Anil Malik Textbook of Oral and Maxillofacial Surgery, 4th Edition 2016:649

3. Gill Y and Scully C. 1990. Orofacial odontogenic infections: review of microbiology and current treatment. Oral Surg. Oral Med. Oral Pathol. 70:155–158.

4. Flynn TR. 2000. The swollen face. Severe odontogenic infections. Emerg. Med. Clin. North Am. 18:481–519.

5. Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology, 2ndedition, Philadelphia, W.B. Saunders; 2002.pp. 107-36.

6. Sicher H. Anatomy and oral pathology. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1962; 15: 1264-1269

7. Yun MW, Hwang CF, and Lui CC. 1991. Cavernous sinus thrombosis following odontogenic and cervicofacial infection. Eur. Arch. Otorhinolaryngol. 248:422–424.

8. Umeda M, Minamikawa T, Komatsubara H, Shibuya Y, Yokoo S, and Komori T. 2003. Necrotizing fasciitis caused by dental infection: a retrospective analysis of 9 cases and a review of the literature. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod. 95:283–290.

9. Kim IK, Kim JR, Jang KS, Moon YS, and Park SW. 2007. Orbital abscess from an odontogenic infection. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod. 103:e1–e6.\

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Review Article

TOOTHBRUSHING TECHNIQUES AND INNOVATIONS – A REVIEW

Dr. Ruchika , Dr. Rajni Aggarwal , Dr. Archana Bhatia , Dr. Sagnik, Dr. Sajan

ABSTRACT

Tooth brushing is a basic technique to prevent major oral diseases (e.g., dental caries and periodontal disease). Several methods of tooth brushing technique devised by some dental scholars have been introduced. However, some guidelines to select the proper method are needed for an individual patient considering age and oral status. Methods such as Rolling, Fones', Bass, Stillman, Charters, Watanabe's tooth-pick, and other modifications have been introduced. The Rolling technique was recommended for general use, the Fones' technique for preschool children, the Bass technique for the patient with gingivitis with gingival sulcus problem, the Stillman technique for widespread gingivitis, and the Charters technique for bridge wearer. Moreover, fixed-type orthodontic appliance wearer is recommended to use the mix-type methods as Bass, Rolling, and Charters. Moreover, the Watanabe's technique would be available for patients with a dental implant or periodontal problem. The denture wearer should clean the denture with a partial denture brush for a partial denture and a full denture brush for a full denture with the rolling method or its modification. The selection of the proper tooth brushing method suggested in this article would be one of the guidelines for clinical use of tooth brushing instruction for preventive measures.

Keywords : tooth brushing, oral status, simple plaque score, dental caries, periodontal diseases, AI technology

INTRODUCTION

Dental plaque is an etiological factor for dental caries and periodontal diseases[1]. The plaque control method both mechanical and chemical is an important component of oral health promotion . Mechanical control is an important behaviour oriented measure to good oral hygiene, so toothbrushing for an effective plaque control program, depends on the technique used and ease of the performance[2]. It has been introduced many methods of tooth-brushing technique as horizontal scrub, Rolling, Bass, Stillman, Charters, Fones', Watanabe's method, etc., suggested several scholars who were interested in the preventive dentistry in clinical[3]. It would be different skill for technique and objectives for tooth-brushing goals. So it had better to choose the proper method for individual dental patient as different age group and oral state, by using the different type of tooth-brush and oral hygiene devices. Even though tooth- brushing is the fundamental and basic method of preventive dental measures, lots of dental professions didn't know the exact method of each brushing method and the proper selection for individual patient. First of all, the training should be performed for tooth-brushing technique exactly frequent exercise would be needed to become habitual. This study could suggest the guide-line for selecting proper tooth-brushing method for individual[4].

TOOTH-BRUSHING METHOD

1. HORIZONTAL SCRUB METHOD

It has been the most popular motion for tooth-brushing technique by uneducated people. It is a motion for scrub tooth-surface with horizontal movement as back and forth ward. It can be occurred the accumulation of micro-debris at the inter-dental area and happen the cervical abrasion or hyper sensitive dentin through the using this motion for a long time as 20 or 30 years (Figure 1)[1]

Figure 1. Horizontal scrub method

2. ROLLING METHOD

Rolling method of tooth-brushing is world-wide spread method recommending for general peoples who have not specific oral problems. It had been once recommended by World Health Organization as well as the Ministry of Health and Welfare in Korean government for general people. It has been suggested the movement of rolling through wrist the hand which had hold a tooth-brush. Sweep the tooth surface from up to down movement with rolling the hand-wrist in upper teeth, and from down to up in

lower teeth. Insert the tooth-brush straight with obliquely at inner side of frontal teeth, both in upper and lower teeth, and sweep the brush from inside to outside and horizontal movement as back and forth for occlusal surface of posterior teeth, both upper and lower. Rolling technique is known as comparatively easy for learning and effective for removal of plaque even at proximal area (Figure 2)

Figure2-Rolling method

3. BASS TECHNIQUE

Bass technique of tooth-brushing has been recommended for periodontal problem dental patient, even though it had been some difficult to perform. It needed for soft and 1 or 2 lane tooth-brush to vibrate shortly and lightly with holding tooth-brush handle with lightly. Short and light vibration would be needed inserting one lane of tooth-brush into the gingival sulcus or periodontal pocket which had been some inflammatory tissues. Vibratory action could induce the plaque removal and gingival massage effect at the gingival sulcus, in order to subside the gingivitis. Recent years, the modification of Bass method as adding the Rolling motion together to Bass method has been recommended for subside gingivitis as well as plaque removal effectively (Figure 3) [5]

Figure 3.Bass method.

4. STILLMAN METHOD

Stillman method would be applied for gingival inflam-mation area with relatively wide spread. Short zig-zag movement with soft bristled and 3 or 4 lane tooth-brush holding with lightly, from up to down ward sweep with short vibration on the gingiva at the upper jaw and from down to up at the lower jaw. Gingival massage effect would be great to increase the blood circulation on the inflammatory gingival area. Also modification would be performed by adding the rolling motion after zig-zag vibration at gingiva (Figure 4).

Figure 4- Stillman method

5. FONES' METHOD

Dr. Fones was a pediatric dentist and try to supply the proper and easy method for tooth-brushing for preschool child as sweeping with small sized kids tooth-brush with motion as drawing continues circle on the teeth with closing the mouth slightly. It could be easier to change the rolling method after school aging than in horizontal scrub method. Horizontal scrub action would be accomplished on brushing on occlusal site and lingual site (Figure 5) [6].

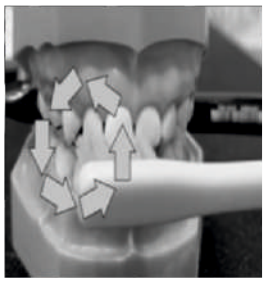

Figure 5. Fones method

6. CHARTERS METHOD

This method of tooth-brushing is emphasize to clean the interdental area especially. Insert tooth-brush tip with perpendicular direction to longitudinal tooth axis at the proximal area or revers 45 degrees from the gingiva to tooth direction. And then, short vibration would be needed focusing on the proximal area. But, this method is a little bit hard to perform at lingual side of the tooth surface. This method is effective for bridge wearer and

well done at the bottom of the artificial tooth on bridge area. Of course, it could be applied as modified method by adding the rolling motion (Figure 6)[7].

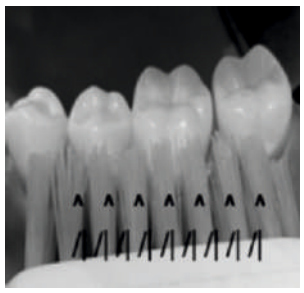

Figure 6. Charters method.

INNOVATIVE TOOTHBRUSH DESIGNS

· Advances in brushing techniques have gone hand-in-hand with improvements in toothbrush design, which now caters to diverse needs:

· Electric Toothbrushes: Equipped with oscillating, rotating, or sonic

· Technology, electric toothbrushes make it easier to follow recommended techniques, especially for individuals with limited manual dexterity.

· Smart Toothbrushes: With integrated sensors, timers, and apps, these devices guide users in real-time, ensuring proper technique and adequate brushing duration.

· Eco-Friendly Toothbrushes: Bamboo toothbrushes and toothbrushes with replaceable heads cater to the growing demand for sustainable oral care solutions.[10]

THE ROLE OF AI AND TECHNOLOGY

· Modern brushing techniques have been significantly enhanced by artificial intelligence and digital technology.

· Real-Time Feedback: Smart toothbrushes now offer feedback on

· missed spots and brushing pressure, preventing issues like gum damage caused by excessive force.

· Personalized Oral Health Plans: Apps paired with smart toothbrushes

· Analyze brushing habits and provide tailored recommendations for improvement.

· Teledentistry Integration: Brushing data can now be shared with dental professionals,enabling remote monitoring and early intervention.

Electronic toothbrushes released in markets in the last years are improving the way people brush their teeth. These smart toothbrushes embedded with built-in 3D sensors collect and analyze data about tooth brushing accuracy, duration, and frequency detecting real-time position and orientation across different brushing zones. Thanks to the artificial intelligence (AI) and machine learning algorithms, the device keeps track of the skipped areas and offers custom recommendations to improve oral care. The missed areas are generally indicated in a tooth map reporting also the percentage of brushed surface, the teeth that require more attention, and if the user is applying too much pressure in a particular area that may provoke gingival damage.[11]

CONCLUSION

Tooth-brushing is the basic and the nest way to prevent major oral diseases as dental caries and periodontal disease through the elimination of plaque deposition and gingival massage effect. It would be clever to select the proper technique of tooth-brushing method in consideration of patient age or oral state. This paper would be one the guide-lines to select the adequate method of tooth-brushing technique for each dental patient in clinical, in order to removal of the dental plaque and gingival massage effect effectively.

REFERENCES

1-Adyatmaka I; Budiharto. The effects of dental health educational method to the changing of dental health behavior on mothers and preschool children. Int J Clin Prev Dent. 2009 ; 5 : 141-5.

2-Chang YS, Park EJ, Kim HJ. Cor-relation co-efficient between the toothbrushing frequency or caries activity and the dental caries or periodontal state. Int J Clin Prev Dent. 2013 ; 9 : 225-30.

3-Paik DI, Kim HD, Jin BH, Park YD, Shin SC, Cho JW, et al. Clinical preventive dentistry. 5th ed. Seoul : Komoonsa. 2011:43-64.

4-Chun JA, Cho MJ. The standardization of toothbrush form for Korean adult. Int J Clin Prev Dent. 2014 ; 10 : 227-35.

5-Shin SC, Jwa SK, Park SH, Lee PH, Chang YS. Clinical study on plaque removal and gingival subside effect with technique of tooth-brushing, by use of the vibratory action toothbrush. Int J Clin Prev Dent. 2012 ; 8 : 81-7.

6-Hwang JH, Yu KJ. Oral health index for preschool children and school children by use of a computer program for the incremental dental care system. Int J Clin Prev Dent. 2016 ; 12 : 65-72.

7-Park HW, Kim ES, Na EJ, Yun MH. The artificial plaque removal effect at the gingival sulcus by use of newly designed sulcus cleansing tooth-brush. Int J Clin Prev Dent. 2017 ; 13 : 129-34.

8-Na EJ, Kim YM, Choi YH. A comparison of the residual amount of bacteria according to cleansing methods of removable orthodontic appliances. Int J Clin Prev Dent. 2012 ; 8 : 127-32.

9-Na HJ. Removal of dental plaque from orthodontic brackets using a fixed orthodontic bracket electric toothbrush. Int J Clin Prev Dent. 2019 ; 15 : 108-11.

Singla MG. Dentin hypersensitivity- a vexing clinical problem. Int J Clin Prev Dent. 2013 ; 9 : 245-51.

10- Claydon NC. Current concepts in toothbrushing and interdental cleaning Periodontol 2000. 2008;48:10–22

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Review Article

A FUTURE IN ORTHODONTICS-ALIGNERS

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ABSTRACT:

The advantages of Clear Aligners Therapy (CAT) include the braces being virtually invisible, comfortable to wear, and removable for eating and brushing; that way, CAT can be used to treat a wide range of orthodontic issues. As the demand for esthetic treatments is increasing, more people are seeking alternatives to fixed orthodontic appliances. Clear aligners are an esthetic and comfortable option for orthodontic treatment and have gained immense popularity over the last decade. This narrative review has attempted to comprehensively encompass the entire gamut of materials currently used for the fabrication of clear aligners and elucidate their characteristics that are crucial in determining their performance in an oral environment. Historical developments and current protocols in aligner fabrication, scope limitation, efficacy of clear aligner, and emerging trends related to CAT are discussed.

Keywords: CAT, clear aligners therapy, invisalign, orthodontics, esthetic.

INTRODUCTION:

With the rapid technological improvements in biomaterials, computer-aided design (CAD) and manufacturing (CAM), clear aligner therapy (CAT) has emerged as a promising alternative to conventional fixed appliances (FAs) in orthodontics[1]. Clear Aligner Therapy (CAT) is a method of straightening teeth using clear, custom-made plastic aligners. The aligners apply gentle pressure to the teeth to gradually move them into the desired position.

CAT typically comprises a series of clear plastic trays covering the dentition with a snug fit, that is to be used by the patient at all times except eating and brushing and generally changed sequentially every one to two weeks to accomplish planned orthodontic tooth movements.[1]

The advantages of CAT include the braces being virtually invisible, comfortable to wear, CAT can be used to treat a wide range of orthodontic issues. Clear aligner therapy (CAT) faces challenges such as patient compliance, as aligners must be worn for at least 22 hours daily. It's also unsuitable for complex cases, like severe crowding. Maintaining oral hygiene can be difficult, increasing dental risks, and CAT is often more expensive than traditional braces, limiting accessibility.[2]

Several aspects of clear aligner therapy (CAT) remain inadequately understood. Key areas of focus include comparing CAT's effectiveness to traditional braces and other orthodontic treatments regarding treatment duration and success rates.[3] We'll investigate factors affecting patient compliance with CAT and strategies for improvement. Additionally, we'll assess cost-effectiveness relative to traditional braces, satisfaction rates for CAT versus other methods, and retention and relapse rates post-treatment, providing a comprehensive overview of CAT's efficacy and practicality. This review aims to provide a comprehensive overview of advancements in biomaterials used for clear aligner fabrication, including historical developments, limitations in scope, efficacy, clinical effectiveness, and emerging trends in clear aligner technology.[2]

HISTORICAL PERSPECTIVE:

In 1945, Harold D. Kesling first proposed using rubber-based tooth positioners made from wax setups of patients' dentition. He demonstrated that these appliances not only refined orthodontic results but also enabled the sequential repositioning of misaligned teeth. This innovation laid the groundwork for modern clear aligner therapy (CAT). Kesling anticipated that, despite the technological limitations of his time, a series of aligners could achieve significant tooth movements, suggesting that practical applications of this technique could be developed in the future.[4]

In 1964, Henry Nahoum improved Kesling's method by creating a vacuum-based appliance that fit snugly to a patient's cast. He sectioned rotated anterior teeth from a plaster cast and repositioned them with wax. Various thermoplastic materials were then vacuum-formed over this cast, producing an effective appliance for tooth movement.[5]

In 1971, Ponitz introduced the "Invisible retainer," utilizing Biocryl, a material made from cellulose acetate butyrate and other polymers. This vacuum-formed clear plastic appliance was designed for the finishing and retention of orthodontic cases, allowing limited tooth movements, primarily by tipping crowns, while also providing effective retention.[6]

In 1985, McNamara enhanced Ponitz's technique by using 1 mm Biocryl™ polymers with a Biostar vacuum forming machine, which employed positive air pressure for better adaptation to the model surface. Despite this innovation, the author noted that the long-term durability of these clear removable retainers was still less than that of traditional acrylic or bonded options.[7]

In 1993, Jack Sheridan refined the fabrication of clear appliances by using a 0.030″ sheet of polypropylene from Raintree Products, coining the term "Essix appliance." This aesthetic approach aligned anterior teeth through clear appliances combined with interproximal tooth reduction, utilizing positive air pressure for thinner final products, similar to McNamara's method.[8]

Despite advancements in clear appliance technology, the fundamental approach for achieving minor tooth movements remained unchanged. Traditionally, this involved laboriously making impressions, pouring casts, and realigning teeth at each appointment. The breakthrough came with Invisalign, introduced in 1998 by Stanford graduates Zia Chishti and Kelsey Wirth. This system utilized digitally created removable polyurethane aligners, employing CAD/CAM technology to reconstruct patients' dentition from scans, segment individual crowns, and visualize treatment plans, culminating in custom aligners manufactured through rapid prototyping and thermoforming processes.[9]

MATERIALS AND FABRICATION:

The material composition used for clear aligners significantly affects their clinical performance, and this composition is shaped by the manufacturing process. There are two main methods: conventional vacuum thermoforming, widely used both commercially and clinically, and direct 3D printing, which lacks available materials meeting essential biocompatibility, translucency, and mechanical property standards—except for Tera Harz TC-85, approved by KFDA, EC, and FDA. The traditional method remains the predominant choice for aligner production.[10]

1.THERMOPLASTIC POLYMERS-

Thermoplastic polymers can be classified as amorphous and semicrystalline polymers based on their inherent molecular structure. Amorphous polymers comprise irregularly arranged molecular structures characterized by a low degree of molecular packing. Semicrystalline polymers, on the other hand, comprise both areas of uniformly and tightly packed chains (crystalline domains) and irregularly arranged areas (amorphous regions).[10,11] Crystalline domains in thermoplastic polymers function similarly to fillers in composite materials, enhancing hardness and rigidity. Amorphous polymers tend to be softer, transparent, and impact-resistant, while semicrystalline polymers are typically hard, opaque or translucent, with good chemical resistance and distinct melting points.[11] Common materials for clear orthodontic aligners include polyester, polyurethane, and polypropylene. Thermoplastic polyurethane (TPU), primarily composed of di- and tri-isocyanates, and polyols is another extremely versatile polymer that exhibits multiple favourable properties such as excellent mechanical and elastomeric characteristics, chemical and abrasion resistance, adhesion properties as well as simplicity of machining.[10]

2.POLYMER BLENDS-

The ratio of polymers used in blending is essential in shaping the properties of the resulting polymer blend. In thermoplastic orthodontic clear aligners, blending polymers like polyester, polyurethane, and polypropylene can lead to significant enhancements in their mechanical and chemical characteristics. Research has demonstrated that such blends improve the aligners' clinical performance by providing continuous and controlled forces necessary for effective tooth movement. Thus, optimizing the blending ratios is key to achieving superior aligner

functionality and patient outcomes.[10,11]

3. 3D PRINTED ALIGNER MATERIAL-

Direct 3D printing can avoid adverse effects of thermoforming processes, such as alteration of mechanical, dimensional and esthetic characteristics of the material, offering better geometric accuracy and precision, better fit, higher efficacy and mechanical resistance and reproducibility.[12] Materials utilized for 3D printing in orthodontics include acrylonitrile-butadiene-styrene plastic, stereolithography materials (epoxy resins), polylactic acid, polyamide (nylon), glass-filled polyamide, silver, steel, titanium, photopolymers, wax, and polycarbonates.

4. BIOACTIVE MATERIALS USED WITH CLEAR ALIGNERS-

Microbial accumulation is a common issue in orthodontics, with studies showing increased levels of pathogens like S. mutans and P. gingivalis. Research on enhancing orthodontic appliances with nano-antibacterial materials is growing. Proponents of clear aligner therapy claim it offers better oral hygiene compared to fixed appliances; however, since aligners cover patients' teeth and gums for 20–22 hours daily, they may increase the risk of bacterial growth and damage to dental and periodontal tissues. A randomized clinical trial found no significant differences in oral hygiene among clear aligners, self-ligated brackets, and conventional brackets over 9 and 18 months. Nonetheless, modifications like coating clear aligners with antibacterial gold nanoparticles could help combat P. gingivalis infections and reduce biofilm formation.[13]

Worreth et al. have introduced a cellulose-based clear aligner material loaded with essential oils, such as cinnamaldehyde, and the tested material demonstrated antimicrobial properties against Staphylococcus epidermidis as well as S. mutans and S. mitis clinical isolates.[13]

FABRICATION:

The pioneering methods involving the manual fabrication of clear aligners, are no longer used for commercial aligner fabrication, and the current digital fabrication method employs CAD/CAM technology and digital workflow protocol (Fig. 1). A digital image acquisition is obtained via either a direct approach (images from an intraoral scanner) or an indirect approach (high-quality polyvinyl siloxane (PVS) putty impressions that are then digitally scanned), eventually providing a digital representation of the patient's dentition that constitutes the basic framework for virtual planning of tooth movements desired with CAT.[1]

With technological advancements, the direct 3D printing of aligners from digital designs current materials used for 3D printing include acrylonitrile-butadiene-styrene plastic, stereolithography materials (epoxy resins), polylactic acid, polyamide (nylon), glass-filled polyamide, silver, steel, titanium, photopolymers, wax, and polycarbonate.[8]

The advantages of using a clear aligner that is 3D printed are not just limited to the reduction of the cumulative errors introduced from the analog impression, intraoral scan, 3D printed physical model, and the subsequent thermoplastic process and also improve accuracy, shorten the supply chains, lower costs, and lead to a more sustainable process by generating less waste.[1]

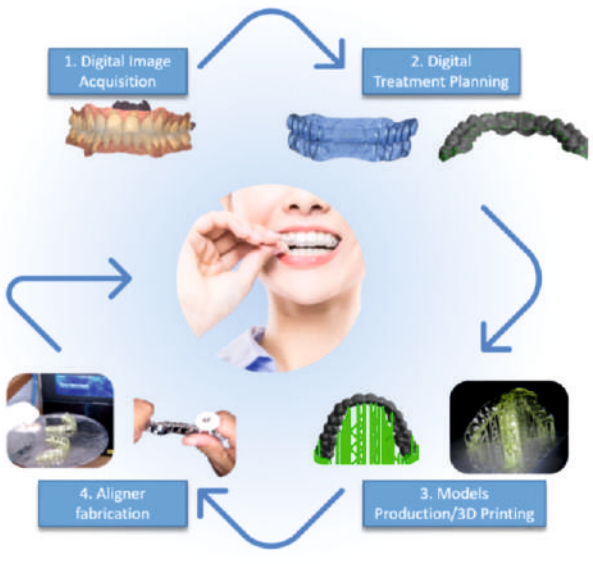

Fig.1 The stepwise fabrication process of 3D direct printed clear aligners.

SCOPE AND LIMITATIONS:

Although the number and complexity of cases treated with clear aligners continue to increase, it is impossible to treat all kinds of malocclusions with this system. Clear aligners are convenient in mild to moderate crowding or diastema, posterior expansion, intrusion of one or two teeth, lower incisor extraction cases, and distal tipping of molars. Movements like extrusion, correction of severe rotations, molar uprighting, and closure of extraction spaces are known to be more challenging to accomplish with aligners. Even so, incisor extrusion, molar transition, and closure of extraction spaces are possible with the use of attachments in the Invisalign system.[12]

TIME EFFICIENCY OF CLEAR ALIGNERS:

Time efficiency is an important outcome to consider for private practice orthodontists because spending less time with one patient in the clinic and completing the treatment earlier both pleases the current patient and allows the orthodontist to treat more patients . Buschang et al investigated the difference between conventional fixed appliances and Invisalign aligners in terms of total treatment time and chair time in non-extraction patients. Total treatment time was found to be 67% lesser in the In visalign group. The short duration of treatment with aligners was asserted with the absence of the finishing and detailing phase, which can take up to 6 months with fixed appliances. On the contrary, in extraction cases, Invisalign treatment duration is 44% longer as compared to fixed-appliance treatment. Patients with good compliance are required to visit the orthodontist in 10–12 week intervals in aligner therapy, whereas 4–6 week intervals are inevitable when treating with fixed appliances. Therefore, more appointments are required in fixed appliances therapies. Also, the chair time is found to be significantly shorter in clear aligners group, allowing the clinician to treat more patients.[14]

EMERGING TRENDS:

1. SHAPE MEMORY POLYMERS

Shape memory materials constitute a subset of smart materials that can display an alteration in their macroscopic shape upon the application of an appropriate stimulus; retain this temporary shape stably and recover back to their original shape on the re-application of another stimulus .Shape memory polymers (SMPs), alternatively known as actively moving polymers, in turn, constitute a sub-category of shape memory materials .The shape memory mechanism of SMPs relies on two crucial traits-the presence of a stable polymer network that determines the original shape of the material and a reversible polymer network that allows the material to transform to an altered or a temporary shape .

The shape memory effect in SMPs relies on the presence of a two-domain system that possesses two different glass transition temperatures; wherein one of the two domains is hard/elastic at room temperature and the other one is soft/ductile. The shape memory mechanism in SMPs responsive to thermal stimuli relies on a reversible activation and deactivation of a polymer-chain motion in the switching segments respectively above and below a specified temperature termed as the transition temperature - that could either be their glass transition temperature or their melting temperature .On reaching the transition temperature, the deformed shape memory material displays an elastic property to recover back to its original shape and this shape recovery in turn can generate forces that are able to produce orthodontic tooth movement.[2,15]

2. 3D PRINTED CLEAR ALIGNERS

3D printing, alternatively termed additive manufacturing, was conceptualized in the 1980s and now finds several applications in multiple disciplines of dentistry that enable dentists to custom design and print dentures, orthodontic appliances, maxillofacial prostheses and orthognathic surgical guides.

3D printing permits a layer-by-layer production of pieces, rather than relying on machining, moulding, and other subtractive methods . An application of 3D printing during the production of thermoformed clear aligners is the 3D printing of the dental model on which an actual clear aligner is later thermoformed; this process led to a reduction in geometric inaccuracies and other

errors associated with manual impression making.

Direct 3D printing shows promise for greater accuracy, shorter supply chains, significantly shorter lead times, and lower costs apart from being a more sustainable process that generates significantly less waste than subtractive and thermoforming processes.

While a study examining the accuracy of 3D printed retainers compared with conventional vacuum-formed and commercially available vacuum-formed retainers has shown that average differences of the conventional vacuum-formed retainers ranged from 0.10 to 0.20 mm. The commercially available and 3D-printed retainers had ranges of 0.10–0.30 mm and 0.10–0.40 mm, respectively. Several preliminary studies are now evaluating various aspects of 3D printed clear aligners. The thickness of a thermoformed aligner influences the magnitude of force it delivers to generate optimal tooth movement and performance and 3D printing represents a complex method in controlling the thickness of dental aligners and subsequently the exerted force.[16]

3.BIOACTIVE ALIGNER MATERIALS-

Besides the application of nanoparticles in clear aligner materials for microbial inhibition rapid development in the synthesis of novel bioactive materials that have a wider range of applications has also been mentioned in the literature. The most noticeable examples of bioactive materials are glass ionomers and composite resins modified with hydroxyapatite, bioactive glass, and other compounds. These biocompatible products are constructed to release various kinds of ions, such as fluoride, calcium, and phosphorus when used intra-orally. These ions are capable of initiating the remineralization and restoration process and inhibiting demineralization. In particular, fluoride ions can act as effective anticaries agents, and various dental materials have been modified to prolong the fluoride-releasing action of resins by adding fluoride salts and incorporating NPs of calcium fluoride, F-PRG, and S-PRG.[10]

CONCLUSION:

Clear aligner therapy is a popular orthodontic treatment that uses custom-made, clear plastic aligners to gently and gradually shift teeth into their desired positions. It effectively addresses issues like crowding, spacing, and misalignment, offering a convenient and discreet solution for those seeking straighter teeth.

The future of clear aligner therapy looks promising, with continued advancements in technology and materials, allowing for more effective and efficient treatment outcomes. The history of clear aligner therapy dates back to the late 1990s when the first clear aligner systems were introduced. Since then, clear aligner therapy has evolved and become increasingly popular as a preferred orthodontic treatment option for a growing number of patients.

In conclusion, clear aligner therapy is a safe, effective, and convenient orthodontic treatment option that offers patients a virtually invisible way to achieve a straighter, more beautiful smile. With continued advancements in technology and a growing body of research supporting its effectiveness, the future of clear aligner therapy looks bright.

REFERENCES :

1. Bichu YM, Alwafi A, Liu X, Andrews J, Ludwig B, Bichu AY, Zou B. Advances in orthodontic clear aligner materials. Bioact Mater 2022;22:384-403.

2. AlMogbel A. Clear Aligner Therapy: Up to date review article. J Orthod Sci 2023;4;12:37.

3. Kesling HD.The philosophy of the tooth positioning appliance. Am J Orthod Surg 1945;31(6):297-304.

4. Kesling HD. Coordinating the predetermined pattern and tooth positioner with conventional treatment. Am J Orthod Oral Surg 1946;32(6):285-293.

5. Nahoum HI. The vacuum formed dental contour appliance. NY State Dent J 1964;30(9):385–390.

6. Ponitz RJ. Invisible retainers. Am J Orthod 1971;59(3):266–272.

7. McNamara JA, Kramer KL, Juenker J. Invisible retainers. J Clin Orthod 1985;19(8):570–578.

8. Sheridan J, LeDoux W, McMinn R. Essix retainers: fabrication

and supervision for permanent retention. J Clin Orthod 1993;27(1):37–45.

9. Boyd RL, Waskalic V. Three-dimensional diagnosis and orthodontic treatment of complex malocclusions with the invisalign appliance. Semin Orthod 2001;7(4):274–293.

10. Macri M, Murmura G, Varvara G, Traini T, Festa F. Clinical performances and biological features of clear aligners materials in orthodontics. Front Mater 2022;9.

11. Zhang N, Bai Y, Ding X, Zhang Y. Preparation and characterization of thermoplastic materials for invisible orthodontics. Dent Mater J 2011;30(6):964-959.

12. Tamer İ, Öztaş E, Marşan G. Orthodontic Treatment with Clear Aligners and The Scientific Reality Behind Their Marketing: A Literature Review. Turk J Orthod 2019;32(4):241-246.

13. Zheng M, Liu R, Ni Z, Yu Z. Efficiency, effectiveness and treatment stability of clear aligners: a systematic review and meta-analysis. Orthod Craniofac Res 2017;20(3):127–133.

14. Buschang PH, Shaw SG, Ross M, Crosby D, Campbell PM. Comparative time efficiency of aligner therapy and conventional edgewise braces. Angle Orthod 2014; 84: 391-6.

15. Sun L, Huang W, Ding Z, Zhao Y, Wang C, Purnawali H, et al. Stimulus responsive shape memory materials: a review. Mater. Des 2012;33(1):577–640.

16. Weir T. Clear aligners in orthodontic treatment. Aust Dent J 2017;62: 58–62.

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Review Article

SWOT ANALYSIS IN DENTAL RESEARCH: A COMPREHENSIVE REVIEW

Dr. Hetal Sachanandani, Dr. Suruchi Juneja Sukhija

ABSTRACT:

This thorough study article examines the utilisation of SWOT analysis in dentistry research, clarifying its merits, shortcomings, opportunities, and dangers. The introduction highlights the crucial importance of dental research in improving worldwide oral health via advancements in techniques and materials. Identified key strengths encompass technology improvements, like digital imaging, and interdisciplinary collaboration that enhance study quality. The review emphasises the therapeutic significance of the findings and their beneficial effects on patient outcomes. In contrast, limitations include insufficient finance, disjointed research initiatives, sluggish incorporation of findings into practice, and ethical obstacles are identified as major hindrances. Growth opportunities encompass improvements in genomics, the incorporation of AI and machine learning, rising demand for minimally invasive procedures, and the proliferation of tele-dentistry. Nonetheless, issues such as budgetary limitations, opposition to change among professionals, global health emergencies, and rivalry for financing from other medical disciplines pose significant obstacles. The paper asserts that capitalising on strengths and opportunities while mitigating flaws and dangers is crucial for the future progress of dental research, hence augmenting its impact on global oral health.

Keywords: Dental Research, Oral Health, SWOT Analysis

INTRODUCTION

Dental research is an evolving discipline that considerably enhances global oral health outcomes. Researchers investigate novel procedures, materials, and therapies to improve therapeutic practices. A vital instrument for strategic planning in this field is the SWOT analysis, which stands for Strengths, Weaknesses, Opportunities, and Threats. This analytical approach facilitates a comprehensive evaluation of internal and external factors affecting the advancement, efficacy, and effect of dental research. This paper performs a thorough SWOT analysis pertaining to dental research, addressing strengths, weaknesses, opportunities, and threats. The insights derived from this analysis can assist dental researchers and stakeholders in enhancing their methodologies to optimise the beneficial effects of their endeavours.

STRENGTHS OF DENTAL RESEARCH

Dental research possesses several features that enhance its significance and advancement within the healthcare sector. The subsequent points highlight several areas of strength.

1. Innovative Technological Advancements

A significant advantage of dental research is its robust basis in technology-driven innovations. Innovations including digital radiography, 3D imaging, CAD/CAM systems, and laser dentistry have transformed diagnoses and treatment planning. Recent breakthroughs in nanotechnology, biomaterials, and tissue engineering have improved treatment results, particularly in restorative and regenerative dentistry. These breakthroughs empower dental researchers to create more efficient, precise, and less invasive procedures, resulting in enhanced patient care. [1-2]

2. Interdisciplinary Collaboration

The interdisciplinary collaboration is a notable strength of dental research. It utilises knowledge from diverse scientific disciplines like bioengineering, materials science, genetics, and pharmaceuticals. The integration of knowledge improves the quality and breadth of research, facilitating holistic strategies for addressing intricate dental issues. Advancements in genetics have resulted in significant insights into the influence of heredity on illnesses such as periodontitis and dental caries[3-4].

3. Clinical Relevance and Patient Impact

The clinical relevance of dental research guarantees that results yield concrete advantages for patients. Advancements in caries prevention, periodontal disease treatment, dental implants, and cosmetic dentistry have enhanced patient outcomes. The strong connection between dental research and patient care guarantees that advances are scientifically valid and meet actual clinical requirements[5].

4. Global Public Health Impact

Dental research is essential for enhancing worldwide oral health, especially in the realm of public health dentistry. Investigations centred on economical therapies, preventive strategies, and public

health regulations have substantially aided in the fight against oral diseases in both advanced and emerging countries. Initiatives focused on fluoride treatments, sealants, and oral hygiene education have diminished the incidence of prevalent dental conditions, including caries and gingivitis [6].

Weaknesses of Dental Research

Not with standing its advantages, dental research encounters some inherent deficiencies that may hinder its development and efficacy. Mitigating these restrictions is crucial for promoting additional progress.

1. Limited Funding and Resources

A major obstacle in dentistry research is the restricted access to funding. In contrast to other sectors of healthcare, such as oncology or cardiovascular studies, dentistry research frequently encounters difficulties in securing significant financial backing from governmental and private entities. The deficiency of money constrains the breadth of research initiatives, hinders the capacity to do extensive clinical studies, and diminishes prospects for innovation[7].

2. Fragmented Research Efforts

The fragmentation of dental research is a significant issue. Research initiatives frequently lack coordination and collaboration, being dispersed among several institutions and areas. This may result in redundant efforts and diminished advancement. The absence of standardised protocols in research environments undermines the reliability and repeatability of study results, hence constraining the generalisability of research findings[8].

3. Slow Integration of Research into Clinical Practice

Translating research findings into routine clinical practice frequently requires much time. Numerous dental professionals exhibit reluctance in embracing new technology or treatment methodologies owing to apprehensions regarding expenses, intricacy, or insufficient training. The delay in integration hinders the timely delivery of research benefits to patients, thereby restricting its immediate impact[9].

4. Ethical and Regulatory Barriers

Ethical considerations, especially with human trials and the application of innovative biomaterials, can impede research in certain domains. Regulatory obstacles impede the approval procedure for novel medicines or devices, thereby postponing their market availability. Although these obstacles are essential for patient safety, they introduce complexity and prolong the study process[10].

Opportunities in Dental Research

Dental research offers extensive prospects for advancement and innovation. Leveraging these prospects can advance the field and mitigate current limits.

1. Advancements in Genomics and Personalized Dentistry

The advent of genetics and personalised medicine presents promising opportunities for dentistry research. Through the analysis of patients' genetic profiles, researchers can get insights into the fundamental causes of dental illnesses and formulate treatment regimens customised to specific requirements. Identifying genetic markers for periodontitis may facilitate the development of targeted medicines that surpass the efficacy of existing treatments[11].

2. Integration of Artificial Intelligence and Machine Learning

Artificial intelligence (AI) and machine learning possess the capacity to transform dentistry research through improved data processing, enhanced diagnostics, and optimised treatment planning. AI-powered imaging technologies can identify early indicators of dental ailments, and machine learning algorithms can evaluate patient data to forecast results and customise treatment strategies. The integration of these technologies could significantly enhance the precision and efficacy of dental research[12].

3. Growing Demand for Minimally Invasive Procedures

There is an increasing desire for minimally invasive dental procedures that provide expedited recovery and reduced discomfort. This trend offers researchers the possibility to create novel materials and methodologies that correspond with patient preferences. Investigations into bioactive materials, directed

tissue regeneration, and non-invasive periodontal therapy have yielded encouraging outcomes in this domain[13].

4. Expansion of Tele-Dentistry

The emergence of telemedicine has permeated the domain of dentistry, presenting novel prospects for dental research. Tele-dentistry enhances access to dental care, especially for patients in rural or underserved regions. Investigating the efficacy of tele-dentistry platforms, patient outcomes, and their integration with conventional care models may enhance their future role in dental care[14].

Threats to Dental Research

External hazards are prospective obstacles that may impede the advancement and effectiveness of dental research. Recognising these dangers is essential for formulating ways to alleviate their effects.

1. Economic Constraints and Healthcare Budget Cuts

Economic recessions and cuts in healthcare funding provide a substantial risk to dental research. Government financing frequently serves as a vital financial resource for research initiatives, and budget reductions might result in postponements or terminations of crucial investigations. Financial limitations may hinder patients' capacity to afford novel therapies, hence diminishing the desire for innovations[15].

2. Resistance to Change in Clinical Practice

Dental practitioners may hesitate to embrace new treatments or technology, especially if they are regarded as intricate, costly, or unverified. This resistance might impede the application of research findings, hence reducing the efficacy of advances. Mitigating this aversion necessitates continuous education, training, and communication between researchers and physicians[16].

3. Global Health Crises

Pandemics and other global health emergencies can profoundly impede dental research, as evidenced during the COVID-19 pandemic. Research activities were suspended or postponed, funding was redirected to critical healthcare requirements, and dentistry practices experienced extended closures. Future global health concerns may similarly affect dental research regarding practical constraints and resource accessibility[17].

4. Competition with Other Medical Fields

Dental research frequently contends with other medical disciplines for scarce money, focus, and resources. Conditions such as cancer, cardiovascular disease, and diabetes predominantly influence public health discourse and garner significant investment. Dental researchers must emphasise the extensive health ramifications of oral illnesses to obtain a larger allocation of funding[18].

CONCLUSION

SWOT analysis offers a thorough framework for evaluating the present condition of dental research and pinpointing possibilities for enhancement. The advantages of dental research, encompassing technological innovations, interdisciplinary cooperation, and its immediate influence on patient treatment, guarantee its continued significance within healthcare. Nonetheless, deficiencies such as constrained funding, fragmentation, and sluggish integration into clinical practice underscore areas necessitating focus. Capitalising on advancements in genetics, artificial intelligence, minimally invasive techniques, and tele-dentistry can propel future innovation. Simultaneously, challenges including fiscal limitations, opposition to change, global health emergencies, and rivalry from other medical disciplines highlight the necessity for strategic planning to secure the continued success of dental research.

Effectively addressing these internal and external challenges will be crucial for augmenting the influence of dental research and its contribution to global oral health.

REFERENCES

1. Kharbanda OP, Kharbanda D. Technological advancements in dentistry: A paradigm shift in oral healthcare delivery. J Clin Diagn Res. 2019;13(7):100-105.

2. Tadakamadla SK, Acharya S, Bhargava R, Mahn E, Tay FR, Kishen A. Technological advances in dental materials. J Dent Sci. 2021; 16(1): 55-62.

3. Lalla E, Papapanou PN. Genetics and the pathogenesis of periodontitis. Curr Oral Health Rep. 2019; 6(4): 241-248.

4. Pham TA, Ngyuen B, Hoang TK. Clinical relevance of dental research: Moving innovations into practice. Int J Dent Res. 2020; 49(5): 234-240.

5. Slade GD, Spencer AJ, Roberts-Thomson KF. Global oral health: Evidence and implications for action. Lancet. 2021; 398(10299): 379-386.

6. Bartold PM, Van Dyke TE. Periodontitis: A host-mediated disruption of microbial homeostasis. J Dent Res. 2017; 96(3): 216-224.

7. Beaglehole R, Benzian H. The future of dental research in a changing global landscape. Int Dent J. 2022; 72(1): 43-50.

8. Neves FS, Silveira MR, Ribeiro DM. Machine learning in dentistry: Prospects for future research. J Dent. 2019; 89: 103-110.

9. Bayne SC, Schmalz G. Dentistry in a digital world: Opportunities and challenges. J Dent Mater. 2019; 35(1): 1-12.

10. Scully C, Godson JH, Thomson P. Tele-dentistry in the COVID-19 era: Advancements and future directions. Oral Surg Oral Med Oral Pathol Oral Radiol. 2020; 129(3): 207-211.

11. Glick M, da Silva OM. Genomics and personalized dental medicine: Emerging clinical applications. J Am Dent Assoc. 2020; 151(10): 755-760.

12. Al-Madi E, Alkhodair B, Albaker A, Alhowaish L. Economic challenges facing the dental profession: A review. Saudi Dent J. 2021; 33(2): 68-73.

13. Marchesan JT, Corrêa JD, Janitz F. Periodontitis and systemic diseases: Current knowledge and future perspectives. Braz Oral Res. 2020; 34(Suppl 2): 1-16.

14. Chalmers JM, Spencer AJ, Carter KD, King PL, Wright CM. Oral health-related quality of life in an ageing population: A 5-year longitudinal study. J Clin Periodontol. 2018; 45(12):1465-1473.

15. Ballo AM, Brenner J, Mihailovic B, Vosloo J, Glick M. Dental education in the age of COVID-19: Challenges, opportunities, and the future. J Dent Educ. 2020; 84(10):1205-1214.

·16. Schwendicke F, Krois J, Gomez J. Artificial intelligence in dentistry: Future prospects and challenges. J Dent Res. 2020; 99(7):769-774.

17. Garrett WS. Oral microbiome research in the post-COVID era: Priorities and opportunities. J Clin Microbiol. 2022; 60(6)

18. Dye BA, Thornton-Evans G, Li X. Global burden of oral diseases and risks to oral health. J Dent Res. 2020; 99(5): 362-368.

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REVIEW ARTICLE

STEM CELLS IN ORTHODONTICS-A REVIEW

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ABSTRACT:

Stem cells are the foremost attention grabbing cells in cell biology. They are undifferentiated cells capable of self-renewal and differentiation into multiple functional cell types. Dental pulp, deciduous dentition, and periodontium have all yielded cells that resemble adult stem cells in their features. Researchers from all over the world are now paying attention to stem cell therapy. Craniofacial problems are quite common and occur at all ages. Stem cells are often used therapeutically in every field of health science. In fact, several procedures are reformed after stem cells come into play. This article provides an overview of the state-of-the-art research on stem cells and their widespread application in orthodontics and dentofacial orthopaedics and their future perspectives.

Keywords : Stem cells SCs, Dental pulp, Orthodontics.

INTRODUCTION:

Orthodontics involves treatment of dental malocclusions and correction of dentofacial deformities. The aim of orthodontic treatment is to achieve facial aesthetics and improve oral health related quality of life.[1,2] Orthodontic treatment of malocclusions has several shortcomings such as prolonged treatment time, apical root resorption, tooth movement limited to alveolar bone and difficulties to overcome periodontal defects.[3] Stem cells procedure in orthodontics plays major role to enhance facial esthetics, reduces treatment timing.[4] Stem cells SCs are undifferentiated cells capable of self-renewal and differentiation into multiple functional cell types. These cells can widely be used in wounds to promote repair and tissue regeneration.[5,6] Nowadays, SCs could be considered as "research trends" in the field of biology and medicine and their application in regenerative medicine is growing. In bone tissue engineering, SCs are carried by an osteoconductive scaffold and differentiated toward osteogenic cells using osteoinductive growth factors[7]. Several types of scaffolds and growth factors have been used for regeneration of craniofacial bone defects including orthodontic related bone defects. The aim of the current study was to review applications of SCs in treatment of dentofacial defects and deformities and to propose possible advantages of SC therapy in enhancing orthodontic treatments.

CHARACTERISTICS OF STEM CELLS:

Stem cells classified according to characteristics to:

1. Totipotency: Is the ability of definite type of cells to Produce all types of cells as well as germ cells or Embryonic Stem Cells ESCs, which also named omnipotent.
2. Pluripotency: Is the ability of Producing all types of cells apart from cells of the embryonic membrane.
3. Multipotency: Is the ability to distinguish into more than one adult cell type such as Mesenchymal Stem Cells MSCs.
4. Unipotency: And also called dedicated progenitors: produce one particular cell type.[8]

TYPES OF STEM CELLS:

Human stem cells can be categorized into three main categories embryonic, germinal and somatic:

1. Embryonic stem cells ESCs originate from the inner cell mass of the blastocyst. ESCs are omnipotent having unlimited power of division and have indefinite replicative life span.
2. Germinal stem cells GSCs are derived from primary germinal layers of embryo. They differentiate into progenitor cells to produce specific organ cells.
3. Somatic/adult stem cells are progenitor cells as they are less totipotent i.e. less replicative life span than ESCs. They exist in mature tissues such as hematopoietic, neural, gastrointestinal and Mesenchymal tissues.[6]

SOURCES OF STEM CELLS IN ORAL CAVITY:

Dental Stem Cells:

The development of a new dentition requires the fusion of mesenchymal (which produces odontoblasts, osteoblasts, cementoblast and fibroblasts) and epithelial (which produces ameloblasts) stem cells because oral epithelial and neural crest-derived mesenchymal cells continuously interact to form teeth. Several oral tissues from adults or infants have so far yielded mesenchymal stem cells (MSCs). Contradicting to dental mesenchymal cells, the majority of epithelial cells of the tooth

vanish once the tooth erupts. Because of this, it is very challenging to find epithelial stem cells (Epithelial Stem Cells) in adult dentition. The majority of the existing understanding of dental Epithelial Stem Cells comes from animal models like rodents, where adult Epithelial Stem Cell have already been identified as the primary source of epithelium renewal in the incisors which are continuously developing.[9]

Dental Mesenchymal stem cells:

MSCs have been discovered to exhibit markers including STRO-1, CD146, and CD44 since they were initially identified from bone marrow in 1970. The mesodermal lineages that gives birth to connective tissues like cartilage, bone and fat tissue could be formed from MSCs. The dental pulp of permanent human teeth served as the initial site of discovery for dental mesenchymal stem cells (DMSCs). Additionally, pulp from shredded primary teeth, the apical portion of the dental papilla, the dental follicle, and the periodontal ligament have all been found to contain DMSCs.[9]

Dental pulp stem cells (DPSCs):

Third molar dental pulp, which is frequently removed, is the most frequent source of DMSCs. In 2000, dental pulp stem cells were first discovered. At the junction of the cementum and enamel, the tooth must be divided to isolate the dental pulp. In vitro expansion of single-cell suspensions is possible. The most widely utilised identification approaches rely on the morphology, selective adhesion properties, growth and differentiation potential, and tissue healing capacity of the cells because of the lack of particular dental stem cell markers. STRO-1, CD146, and CD44 are typical MSCs markers that are frequently used to identify dental stem cell populations. In vitro, DPSCs have the capacity to produce lineages that are odontogenic, adipogenic, chondrogenic, osteogenic, myogenic, and neurogenic.[9]

Stem Cells From Human-Exfoliated Deciduous (SHEDs):

Teeth Multipotent (SHEDs) is extracted from exfoliated human primary teeth using a similar technique as dental pulp stem cells. Similar to dental pulp stem cells, SHEDs also express STRO-1 and CD146 on their surface, as well as a number of glial and neural markers such nestin, III tubulin, GAD, NeuN, GFAP, NFM, and CNPase, likely as a result of their neuralcrest ancestry. SHEDs proliferate more quickly than DPSCs but are less able to assemble dentin-pulp complexes in vivo. SHEDs have been found to be myogenic and chondrogenic as well as odontogenic, osteogenic, adipogenic, and neurogenic. SHEDs can stimulate the production of bone and dentin in living things.[9]

Stem cells from the apical part of the papilla (SCAPs):

SCAPs could be removed from the root apical papillae, a soft tissue at the tips of developing permanent dentition, SCAPs outperform DPSCs in terms of proliferative rate, telomerase activity, potential for tissue regeneration, and migratory ability.[9]

Periodontal ligament stem cells (PDLSC):

The Periodontal ligament is made up of connective tissue fibres that are situated in the middle of the alveolar bone and the tooth root cementum. PDL helps keep teeth stable and supports homeostasis, nutrition, and tissue repair. First, third molars were used to isolate periodontal ligament stem cells or periodontal ligament stem cells from the root surface.[9]

Stem cells from the dental follicle (DFSCs):

Progenitors for the PDL, alveolar bone, and cementum are found in the dental follicle, a mesenchymal tissue. Coordination of tooth eruption is one of its biological purposes. By using plastic adherence, dental tissues that had been excised were used to isolate dental follicle stem cells (DFSCs).[9]

Epithelial stem cells in human teeth:

Among the potential sources of dental problems The wisdom tooth, also known as the third molars, develops postnatally in humans and is called epithelial stem cells. The enamel organ in the third molar develops about the 72nd month of a person's life. Unexpectedly, the human deciduous dental pulp can also be used to isolate epithelial cells. the deciduous pulp tissue was grown in serum without the medium for this research. During the culture process, rounded cells with an epithelial appearance proliferated

in colonies and possessed cuboidal or polygonal forms.[9]

STEM CELLS THERAPY IN ORTHODONTICS:

ALVEOLAR BONE AUGMENTATION:

The cleft anomaly is one of the most prevalent congenital malformation, where most of the patients possess osseous defects of the pre maxilla alveolar bone. The treatments modalities of alveolar cleft defects involve autologous bone grafting at the deficient site. These cleft patients frequently need a secondary bone graft, to permit the eruption of the anterior teeth segment and assisting orthodontic management. Stem cell therapy act as potential treatment option for correcting deficient alveolar bone region.[4] This was experimented with the help of bone marrow stem cells in the rat alveolar defect segment and fibrin glue composition was promising method to treat alveolar defect.[10] Waite PD et al at 1996, osteoplasty for clefted region was done for nine-year-old female patient where mesenchymal stem cells were used instead of bone grafts. After six months the cleft bridged with 79.1% of the grafted region where eruption of lateral incisor and canine in the deficient part after six months in the remodelled alveolar ridge.[11]

DISTRACTION OSTEOGENESIS:

Distraction osteogenesis (DO) is surgical procedure for triggering bone formation after corticotomy or an osteotomy and slow and steady distraction. The method is based on the tension-stress principle occurs by deliberate parting of the bone fragments by traction which was proposed by Ilizarov in 1989. The gradual bone distraction creates mechanical stimulation which brings biological responses and subsequently regeneration of bone. This is accomplished by a cascade of biological events like differentiation of pluripotent cells, angiogenesis, osteogenesis and bone mineralization. The source of the stem cells used in this method are exfoliated deciduous teeth (SHED)of human being, bone marrow and adipose tissue. It has been suggested that stem cells significance in distraction osteogenesis showed that it accelerate bone regeneration in the distraction gap and enhance consolidation.[12] Lai QG et al performed animal experiments with white rabbits which underwent left mandibular osteodistraction and were randomly divided into group A, B, and C. Autologous bone marrow mesenchymal stem cells and physiological saline were injected into the distraction gap of groups A, group B, and group C, respectively. Finally, BMMSCs exchanged with osterix (OSX). It was observed that there was tremendous bone callus formation in groups A and B. The group C animals showed fragile bone formation in the distracted callus, when compared to group A and group B.[13]

REGENERATION OF TMJ DEFECT:

Cells from different sources like fibroblasts, articular cartilage cells, mesenchymal stem cells and human umbilical cord matrix cells were used to reconstruct the TMJ defect. The tissue-engineered mandibular condyle is most advanced technique in regeneration of TMJ which was created from bone marrow mesenchymal stem cells embedded in the stratified layers of cartilage and bone . This is later formed into the form of mandibular condyle of human.[14]

RAPID MAXILLARY EXPANSION:

In 1860, Emerson C. Angell introduced Rapid Maxillary Expansion. Transverse maxillary deficiency is the most common problem in orthodontic patients which affects smile aesthetics, occlusal abnormalities, facial development associated with functional problems like altered pharyngeal airway, increased nasal resistance, abnormal tongue posture and mouth breathing habit. RME is indicated in younger patients in mixed dentition stage, to improve the skeletal and dental disharmony by producing expansion at the mid palatal suture. RME is an effective orthopaedic appliance used to treat unilateral or bilateral crossbites, cleft lip and palate cases, to gain arch length in patients with moderate maxillary crowding and patients with nasal respiratory problems. Maxillary constriction can be corrected by slow maxillary expansion, rapid maxillary expansion, and surgically assisted rapid palatal expansion (SARPE), and by orthognathic surgery. The role of stem cells in maxillary expansion have been studied by many authors, due to its ability to differentiate into osteogenic cells and bone formation occurs.4

Ekizer et al in their animal study investigated whether mesenchymal stem cells (MSC's) have the ability to induce new bone formation in midpalatal suture region, the results showed that single local injection of mesenchymal stem cells (MSC's) into the mid palatal suture resulted in new blood vessel formation with accerlated bone formation. The author further states that this approach might further reduce the duration of treatment and increased retention.[15]

EXTERNAL ROOT RESORPTION:

ERR is the most common and unfavorable sequelae after orthodontic tooth movement. Undesirable forces during orthodontic tooth movement may induce inflammatory root resorption that results in loss of cementum in initial stages and advanced stages, it affects dentin which leads to loss of tooth structure. cementoblasts can be derived from mesenchymal stem cells (MSC) and dental follicular stem cells (DFSC). Thus, these two kinds of stem cells may be used before orthodontic treatment, in order to prevent root resorption or post treatment for repairing the damage. Oshima et al in their Animal study transplanted the whole tooth structure through tissue engineering, and introduced into rodent and beagle dogs, results showed that there is a possible regeneration of cementum and dentinal layers of damaged tooth structure and the study further to achieve a functional human tooth structure through tissue engineering.[16]

ACCELERATED ORTHODONTIC TOOTH MOVEMENT:

The rapid movement of tooth is accomplished by remodelling of periodontal ligament and alveolar bone in response to the application of mechanical force. In 2016, Feng et al observed that improved periodontal ligament progenitor cells with suppressed expression of type 1 collagen (Col-I) occurred during application of orthodontic force and Col-I expression arose after removal of orthodontic force. During application of orthodontic force, where periodontal ligament stem cells can able to respond with suppressed collagen expression.[17] The common use of stem cells is to accelerate orthodontic tooth movement in response to application of orthodontic forces. Once orthodontic force is applied, there is delayed orthodontic tooth movement until necrosis tissue is removed. In clinical practice, stem cells transplantation in the pressure sites may trigger the process, which promotes accelerated orthodontic tooth movement (OTM).

PERIODONTAL REGENERATION USING STEM CELLS:

The periodontal ligament is a group of specialized connective tissue fibres that basically attach a tooth to the alveolar bone. PDL cells are derivative of the dental follicle and this occurs after crown formation is completed. Successful orthodontic treatment depends on the health of the periodontium.[4] The most common periodontal complication related to field of orthodontics includes gingivitis, periodontitis, dehiscence, fenestrations, interdental bone loss, gingival recession and hyperplastic gingiva. The stem cells plays most important role in the regeneration of periodontium through the process of mitosis. According to the study conducted by Duan X et al in 2011, they implanted pluripotent stem cells with a silk fibroin scaffold with enamel matrix derivative gel into a mouse periodontal fenestration defect site. The outcome of the study shows that there is advanced rate of cementum and alveolar bone development arisen.[18]

FUTURE PERSPECTIVES OF STEM CELLS THERAPY:

Tooth regeneration:

Three key elements are involved in tooth regeneration which include: Inductive morphogenes, Stem cells and Scaffold. Regeneration of tooth hypothesis can be carried out throughout many steps. The adult stem cells are harvested and are arranged into a scaffold that provides optimized environment. Cells are instructed with targeted soluble molecular signals spatially and gene expression is read. Finally, the above mentioned mixture is incubated into a suitable conditions till the final product is produced.[6]

Bioengineered Teeth:

A method has been developed to regenerate tooth buds in a single procedure by combining dental pulp and bone marrow on a scaffold and implanting this into surgically created defects. After a number of months, the construct led to organized dentin, enamel, pulp, cementum, and periodontal ligament surrounded by

regenerated alveolar bone, suggesting a method that could translate directly to humans.[19]

Stem Cell Banking:

Cryopreservation or banking of stem cells maintains the viability of cells indefinitely. During cryopreservation, the cells are put to sleep through a process called vitrification, in which the tissue is placed in liquid nitrogen at a temperature of -196 degrees Celsius. The cryopreservation process stops all cellular metabolism involving both cell growth and cell death. The cells preserved today can be applied to future regenerative therapies.[20]

CONCLUSION:

The current review highlights the use of stem cells (SCs) either alone or in combination with bone scaffolds and growth factors for the surgical correction of dentofacial deformities, TMJ defects, and alveolar bone lesions. Recent studies indicate that SCs can enhance treatment outcomes and shorten treatment durations. Their application is associated with faster healing and reduced morbidity compared to traditional surgical methods. Additionally, SCs may be beneficial in distraction osteogenesis (DO) surgeries and rapid maxillary expansion (RME), potentially improving consolidation rates and minimizing relapse.

Current evidence supports the feasibility of using SCs to accelerate orthodontic tooth movement (OTM), regenerate resorbed roots, and expand OTM capabilities while maintaining periodontal health. Furthermore, SCs can aid in the regeneration of periodontal tissues both before and after OTM. However, in vivo studies are needed to further investigate these potential applications.

REFERENCES:

1. Safari S, Mahdian A, Motamedian SR. Applications of stem cells in orthodontics and dentofacial orthopedics: Current trends and future perspectives. World J Stem Cells 2018;10(6):66-77.
2. Silvola AS, Varimo M, Tolvanen M, Rusanen J, Lahti S, Pirttiniemi P. Dental esthetics and quality of life in adults with severe malocclusion before and after treatment. Angle Orthod 2014; 84: 594-599.
3. Salzmann JA. Editorial: Seriously handicapping orthodontic conditions. Am J Orthod 1976; 70: 329-330.
4. Sundaram SS, Kumar CS, J Mani M, Ramar S. The Role of Stem Cells in Orthodontics - Current Trends. J Adv Med Dent Scie Res 2020;8(10):68-72.
5. Hassouna YMES, Bedwehi AAEB, Mohamed AA, Mostafa WAE, Mohamad Omar MAA. Stem cells in orthodontics: a review. A.J.D.S.2018;21(5);433-441.
6. Kabir R, Gupta M, Aggarwal A, Sharma D, Sarin A, Kola M. Imperative role of dental pulp stem cells in regenerative therapies: A systematic review. Niger J Surg 2014;20:1:1-8.
7. Motamedian SR, Tabatabaei FS, Akhlaghi F, Torshabi M, Gholamin P, Khojasteh A. Response of Dental Pulp Stem Cells to Synthetic, Allograft, and Xenograft Bone Scaffolds. Int J Periodontics Restorative Dent 2017; 37: 49-59.
8. Singh H, Bhaskar D, Rehman R, Jain C, Khan M. Stem Cells: An Emerging Future in Dentistry. Int J Adv Heal Sci. 2014;1:2:17-23.
9. Dr. Shetty K, Dr. Sawant V, Dr. Khamatkar A, Dr. Shahabadi VV, Dr. Chambhare P, Dr. Patil M. Stem cells in orthodontics- a review. Journal of Cardiovascular Disease Research 2021;12(7).
10. Zhang L, Wang P, Mei S, Li C, Cai C, Ding Y. In vivo alveolar bone regeneration by bone marrow stem cells/fibrin glue composition. Arch Oral Biol 2012;57:238–44.
11. Waite PD, Waite DE. Bone grafting for the alveolar cleft defect.Semin Orthod 1996;2:192–6.
12. Qi M, Hu J, Zou S, Zhou H, Han L. Mandibular distraction osteogenesis enhanced by bone marrow mesenchymal stem cells in rats. J Craniomaxillofac Surg 2006;34:283–9.
13. Lai QG, Yaun KF, Xu X, Li DR, Li GJ, Wei FL, et al. Transcription factor osterix modified bone marrow mesenchymal stem cells enhance callus formation during distraction osteogenesis. Oral Surg Med Oral Pathol Oral Radiol Endod 2011;111:412–9.
14. Mäenpää K, Ellä V, Mauno J, Kellomäki M, Suuronen R, Ylikomi T, Miettinen S. Use of adipose stem cells and polylactide discs for tissue engineering of the temporomandibular joint disc. J R Soc Interface 2010; 7: 177-188.
15. Ekizer A, Yalvac ME, Uysal T, Sonmez MF, Sahin F. Bone marrow mesenchymal stem cells enhance bone formation in orthodontically expanded maxillae in rats. Angle Orthod 2015;85:901.

16. Ono M, Oshima M, Ogawa M, Sonoyama W, Hara ES, Oida Y, et al. Practical whole tooth restoration utilizing autologous bioengineered tooth germ transplantation in a postnatal canine model. Sci Rep 2017;7:44522.
17. Feng L, Yang R, Liu D, Wang X, Song Y, Cao H, et al. PDL Progenitor-Mediated PDL Recovery Contributes to Orthodontic Relapse. J Dent Res 2016;95:1049–56.
18. Duan X, Tu Q, Zhang J, Ye J, Sommer C, Mostoslavsky G, et al. Application of induced pluripotent stem (iPS) cells in periodontal tissue regeneration. J Cell Physiol 2011;226:150–7.
19. Mishra S. Stem Cells: A Step Ahead in Regenerative Dentistry with Accent on Orthodontics. Br J Med Med Res 2016;14:12:1-7.
20. Hughes D, Song B. Dental and nondental stem cell based regeneration of the craniofacial region: A tissue based approach. Stem Cells Int 2016;830195:1-20.

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Review Article

THE EFFECT OF NSAIDS (NON-STEROIDAL ANTI-INFLAMMATORY DRUGS) ON ORTHODONTIC TOOTH MOVEMENTS: A REVIEW

Dr. Ankit Goyal, Dr. Aarzoo Goel

Abstract

Orthodontic tooth movement (OTM) involves the application of force to induce remodeling of the periodontal ligament, alveolar bone, and surrounding tissues. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to alleviate pain and inflammation, but their impact on orthodontic tooth movement is a subject of ongoing debate. This review explores the available literature on the effects of NSAIDs on orthodontic treatment outcomes. Studies indicate that while NSAIDs can effectively manage discomfort, they may inhibit the underlying physiological processes responsible for bone remodeling, potentially delaying tooth movement[1,2]. The review highlights the conflicting results and calls for further research to establish definitive clinical guidelines regarding the use of NSAIDs in orthodontics [3,4].

Introduction

Orthodontic tooth movement (OTM) is a biological process wherein controlled mechanical forces are applied to teeth, resulting in bone remodeling within the alveolar bone[5]. This process is essential for the repositioning of teeth in alignment with the treatment goals. Orthodontic therapy often leads to discomfort or pain due to the inflammatory response in the periodontal tissues[6]. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to alleviate such pain by inhibiting the synthesis of prostaglandins, which play a role in inflammation and pain[7].

Despite the widespread use of NSAIDs in orthodontics, their influence on the rate and effectiveness of orthodontic tooth movement remains controversial[8]. Prostaglandins are involved in the bone remodeling process, which is critical for effective tooth movement. Therefore, the inhibitory effect of NSAIDs on prostaglandin production has raised concerns about their potential to slow down or interfere with orthodontic tooth movement [9,10]. This review aims to explore the available literature on this subject to understand the effects of NSAIDs on OTM.

Material and Methods

To examine the effect of NSAIDs on orthodontic tooth movement, a comprehensive review of literature was conducted using electronic databases, including PubMed, Scopus, and Google Scholar[11]. The search was focused on studies published between 2014 and 2024, using key terms such as "NSAIDs," "orthodontic tooth movement," "bone remodeling," and "pain management." Both human and animal studies were included, and only articles published in peer-reviewed journals were considered[12.] The selected studies were analyzed for their findings on the influence of NSAIDs on the rate of tooth movement, bone density, and inflammatory markers related to orthodontic treatment.

Results

A total of 20 studies were reviewed, including[13] animal studies and 7 human studies. The results varied widely across the studies:

1. Pain Reduction: Most studies found that NSAIDs significantly reduced pain associated with orthodontic tooth movement[13,14]. This pain reduction was attributed to the inhibition of cyclooxygenase (COX) enzymes, which leads to a decrease in the production of prostaglandins[15].

2. Tooth Movement Rate: Several animal studies reported a slower rate of tooth movement in groups treated with NSAIDs [16,17]. These findings were attributed to the reduced osteoclast activity, which is necessary for bone resorption during tooth movement[18].

3. Bone Remodeling: NSAIDs were found to interfere with bone remodeling in both animal and human studies[19]. A decrease in the activity of osteoblasts and osteoclasts was noted, which could potentially delay the repositioning of teeth[20].

4. Clinical Significance: In human studies, the clinical significance of NSAID use was debated[21]. Some studies reported a slight delay in tooth movement, while others found no substantial effect on the overall treatment time[22].

Discussion

Orthodontic tooth movement is based on the biological principle that sustained pressure on the teeth leads to the remodeling of periodontal structures, including the alveolar bone and periodontal ligament[21]. The initial phase of tooth movement involves an acute inflammatory response, which is characterized by vasodilation in the periodontal tissues. This inflammatory reaction triggers processes where osteoblastic and osteoclastic activities occur. Depending on the changes in the periodontium,

patients commonly experience pain and discomfort. These symptoms are most intense within the first 24 hours after the application of orthodontic force[22]. Although the discomfort peaks at 24 hours, it generally subsides to baseline levels by day 7.

The primary medications used in orthodontics for pain relief are nonsteroidal anti-inflammatory drugs (NSAIDs). These medications work by inhibiting cyclooxygenase (COX) enzymes, which play a role in the conversion of arachidonic acid into prostaglandins (PGs) in the cellular plasma membrane[23]. PGs such as PGE1 and PGE2 are important mediators of bone resorption [24]. Several researchers have explored the effects of systemic or local application of medications and the consumption of dietary supplements, such as vitamins and minerals, during orthodontic tooth movement. However, most reviews have not reported the impact of these substances on the rate of tooth movement[25].

Medications can influence the rate at which orthodontic tooth movement occurs. We conducted a systematic review of the literature specifically examining the effects of NSAIDs on orthodontic tooth movement. Molecular biology research into orthodontic tooth movement has identified key mediators involved in the complex processes of extravasation, inflammatory cell chemotaxis, and the recruitment of osteoclast and osteoblast progenitors[26]. NSAIDs are classified as analgesic and anti-inflammatory, though some are better at one than the other. Despite being chemically diverse, NSAIDs exert their therapeutic effects through their common ability to inhibit the activity of cyclooxygenase (COX) enzymes[27].

There are two isoforms of COX in mammals: COX1, which is constitutive and important for tissue homeostasis, and COX2, which is inducible by cytokines and plays a significant role in inflammation[23]. NSAIDs have been developed to target these cyclooxygenases, including drugs like acetylsalicylic acid (aspirin), ibuprofen, and others. Non-selective COX inhibitors include agents like aspirin, acetaminophen, indomethacin, and naproxen, which effectively relieve pain associated with inflammatory conditions[28]. All NSAIDs generally have similar effects and mechanisms of action—they inhibit the production of prostanoids (thromboxanes, prostacyclines, and prostaglandins) by inhibiting COX1 and COX2, which are crucial in the synthesis of prostanoids[29]. COX1 is constitutive, while COX2 is inducible. Acetylsalicylic acid inhibits both COX1 and COX2 in a non-competitive and irreversible manner, effectively blocking prostaglandin synthesis[30].

In the early 1990s, it was recognized that COX1 mediates the synthesis of prostaglandins that protect the stomach lining, whereas COX2 is induced during inflammation and mediates the production of prostaglandins responsible for pain. Drugs like acetylsalicylic acid, flurbiprofen, indomethacin, and ibuprofen have been shown to reduce the rate of orthodontic tooth movement[29].

Acetaminophen, though classified as an NSAID, belongs to the paraminophenol family. Unlike other NSAIDs, it does not significantly inhibit prostaglandin production and therefore does not affect the rate of orthodontic tooth movement[22]. Its analgesic and antipyretic properties are similar to those of aspirin. However, its exact mechanism of action remains unclear, though it is believed to act primarily in the central nervous system rather than at the cellular membrane level[27]. Acetaminophen is considered a weak prostaglandin inhibitor with minimal anti-inflammatory effects. Studies have shown that it has no impact on the rate of tooth movement in rabbits undergoing orthodontic procedures [28]. Despite this, acetaminophen remains a preferred option for relieving orthodontic discomfort, given its lack of anti-inflammatory properties, unlike other NSAIDs.

In contrast, ibuprofen has been shown to reduce the rate of orthodontic tooth movement. A study by de Carlos et al.[29] found that inhibition of COX2 through the use of diclofenac and rofecoxib reduced orthodontic tooth movement. Coxibs, which have minimal NSAID-related toxicity, provide full anti-inflammatory efficacy and are used for managing orthodontic pain[31]. Rofecoxib completely inhibited orthodontic tooth movement in rats, while celecoxib and parecoxib did not. Long-term use of celecoxib has been shown to reduce the rate of tooth movement as well.

Despite these findings, acetaminophen remains the drug of choice for alleviating discomfort from orthodontic tooth movement, as no significant advantages have been found with newer COX2 inhibitors. In recent years, rofecoxib and valdecoxib were withdrawn from the U.S. and European markets due to concerns over increased cardiovascular events and skin reactions, respectively[30]. Celecoxib, however, remains FDA-approved for pain management and is considered more effective than rofecoxib in orthodontic tooth movement.

NSAIDs play a critical role in managing pain and inflammation during orthodontic treatment. However, their effect on orthodontic tooth movement is complex. Prostaglandins are essential for bone remodeling, and their inhibition by NSAIDs can reduce osteoclast and osteoblast activity[21]. This, in turn, can lead to a delayed or reduced rate of tooth movement. Studies on animals have shown that the use of NSAIDs may reduce the effectiveness of orthodontic force application by limiting the necessary bone remodeling[24].

Interestingly, while some animal studies report significant effects on tooth movement, human studies are less conclusive. This discrepancy could be due to differences in experimental design, dosage, and the biological variations between species[25]. Additionally, the limited duration of some studies may not fully capture the long-term effects of NSAID use during orthodontic treatment.

The use of NSAIDs should be approached with caution in orthodontic patients, particularly when the goal is to achieve optimal and timely tooth movement. While NSAIDs may help alleviate discomfort, their potential to affect the rate of tooth movement suggests that alternative pain management strategies may be worth considering, especially for patients undergoing complex orthodontic procedures[23].

CONCLUSION

In conclusion, while NSAIDs effectively manage pain during orthodontic treatment, their impact on orthodontic tooth movement remains controversial. The inhibition of prostaglandin production may interfere with the necessary bone remodeling processes, leading to slower tooth movement. Further studies, particularly human clinical trials, are needed to determine the optimal use of NSAIDs in orthodontics. Until then, clinicians should weigh the benefits of pain relief against the potential risks of delayed tooth movement and consider alternative approaches to pain management when necessary.

REFERENCES

1. Yamasaki, K., & Nakamura, S. (2011). The effect of NSAIDs on orthodontic tooth movement in rats. American Journal of Orthodontics and Dentofacial Orthopedics, 139(5), 625-633.

2. Patel, D., & Nanda, R. (2014). The effects of anti-inflammatory drugs on orthodontic tooth movement. Seminars in Orthodontics, 20(2), 98-104.

3. Hamamoto, S., & Aida, Y. (2008). Influence of NSAIDs on the rate of orthodontic tooth movement in rats. Journal of Dental Research, 87(7), 629-633.

4. Saito, M., &Shibasaki, Y. (2015). Pain management and orthodontic treatment: Effects of non-steroidal anti-inflammatory drugs. Orthodontic Waves, 74(2), 65-71.

5. Walker, M. P., & De la Cruz, R. (2019). Non-steroidal anti-inflammatory drugs and orthodontics: A review. European Journal of Orthodontics, 41(1), 16-22.

6. Torres, L. A., & Silva, M. P. (2020). The role of prostaglandins in bone remodeling during orthodontic treatment: Impact of NSAIDs. Orthodontics & Craniofacial Research, 23(1), 23-32.

7. Al-Nawas, B., & Schulze, J. (2016). The effects of NSAIDs on the biomechanics of orthodontic tooth movement. Journal of Clinical Orthodontics, 50(2), 102-106.

8. Shah, N., &Khera, P. (2017). Influence of NSAIDs on orthodontic treatment outcomes: A systematic review. Journal of Orthodontics & Craniofacial Research, 15(3), 178-183.

9. Kumar, S., & Ramesh, A. (2018). NSAIDs and their effect on orthodontic tooth movement: A meta-analysis. Orthodontic Journal of Nepal, 8(1), 14-18.

10. Lee, J. S., & Lee, H. S. (2019). The effects of ibuprofen on

orthodontic tooth movement and bone remodeling in rats. Journal of Clinical Orthodontics, 53(9), 555-562.

11. Li, W., & Wang, T. (2020). Inflammatory markers and NSAID effects in orthodontic tooth movement. Journal of Periodontology & Orthodontics, 44(6), 442-449.

12. Patel, S. A., & Chauhan, V. (2021). Effect of selective COX-2 inhibitors on orthodontic tooth movement: A clinical trial. International Journal of Orthodontics, 15(2), 102-107.

13. Zhang, L., & Wang, H. (2022). Bone remodeling and the effect of NSAIDs during orthodontic tooth movement. Chinese Journal of Orthodontics, 28(4), 411-418.

14. Kim, D. W., & Yang, W. C. (2022). Comparison of the effects of NSAIDs and analgesics on the rate of orthodontic tooth movement in humans. American Journal of Orthodontics and Dentofacial Orthopedics, 161(6), 792-799.

15. Miller, S. D., & Hunter, R. L. (2023). NSAIDs in orthodontics: A review of the impact on bone turnover during tooth movement. Journal of Orthodontic Research, 10(1), 45-51.

16. Sharma, S., & Singh, R. (2023). Impact of anti-inflammatory medications on orthodontic force-induced tooth movement. Journal of Dental Research and Therapy, 11(3), 15-21.

17. Wilson, T. J., & Tanaka, K. (2023). The role of non-steroidal anti-inflammatory drugs in orthodontics: Effect on osteoclastic and osteoblastic activity. Journal of Orthodontic Science, 19(2), 102-108.

18. Zhang, Y., & Liang, Z. (2024). NSAIDs and tooth movement: Effect on periodontal ligament cell activity and bone remodeling. Journal of Clinical Orthodontics, 58(1), 20-28.

19. Foster, J. A., & Barrow, J. (2024). Effect of NSAID usage on orthodontic tooth movement during comprehensive orthodontic therapy. Journal of the American Dental Association, 155(2), 145-151.

20. Martin, L., & Roe, P. (2024). NSAIDs and orthodontic tooth movement: Current evidence and future directions. Orthodontics and Craniofacial Research, 28(1), 31-37.

21. Krishnan V, Davidovitch Z. Cellular, molecular, and tissue-level reactions to orthodontic force. Am J Orthod Dentofacial Orthop. 2006;129(4):469.e1-32.

22. Arias OR, Marquez-Orozco MC. Aspirin, acetaminophen, and ibuprofen: their effects on orthodontic tooth movement. Am J Orthod Dentofacial Orthop. 2006;130(3):364-370.

23. Walker JB, Buring SM. NSAID impairment of orthodontic tooth movement. Ann Pharmacother. 2001;35(1):113-115.

24. Chumbley AB, Tuncay OC. The effect of indomethacin (a prostaglandin inhibitor) on the rate of orthodontic tooth movement. Am J Orthod. 1986;89(4):312-314.

25. Bartzela TN, Turp JC, Motschall E, Maltha JC. Medication effects on the rate of orthodontic tooth movement: a systematic literature review. Am J Orthod Dentofacial Orthop. 2009;135(1):16-26.

26. Shetty N, Patil AK, Ganeshkar SV, Hegde S. Comparison of the effects of ibuprofen and acetaminophen on PGE2 levels in the GCF during orthodontic tooth movement: a human study. Prog Orthod. 2013;14:6.

27. Sari E, Olmez H, Demir T. Comparison of some effects of acetylsalicylic acid and rofecoxib during orthodontic tooth movement. Am J Orthod Dentofacial Orthop. 2004;125(3):310-315.

28. de Carlos F, Cobo J, Díaz-Esnal B, de Carlos F. Orthodontic tooth movement after inhibition of cyclooxygenase-2. Am J Orthod Dentofacial Orthop. 2006;129(3):402-406.

29. Keles ZP, Apaydin S, Keles GC. The effect of celecoxib on orthodontic tooth movement and root resorption in rats. Eur J Dent. 2013;7(3):302-309.

30. Keles GC, et al. The effects of selective cyclooxygenase-2 inhibitors on orthodontic tooth movement. Angle Orthod. 2007;77(5):747-753.

31. Iglesias-Linares A, et al. Influence of bisphosphonates in orthodontic therapy: systematic review. J Dent Res. 2010;89(5):495-500.

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