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EMERGING TRENDS AND TECHNOLOGIES IN ADVANCED RESTORATIVE DENTISTRY- (REVIEW ARTICLE)

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ABSTRACT

In the intricate realm of dentistry, where science and artistry converge, restorative dentistry stands as the vanguard of transformative care. From delicate craftsmanship of recreating natural smiles to relentless pursuit of latest methodologies, this journey through restorative dentistry unveils a saga of precision, innovation, oral well-being and the unwavering commitment to harmonizing form with function. With focus on technological advancements and evolving treatment modalities, this article delves into latest innovative trends such as novel gadgets for dentists by use of lasers, "Fill without drill" using resin impregnation and cold plasma for precise cavity preparation; elective aesthetic procedures (Tooth jewellery, tooth tattoos); snazzy oral hygiene prescriptions(Caries prevention with LASER toothbrush, ionic toothbrush, anti-caries mints); and increased patient participation with intraoral camera for home assessment of caries and at-home bleaching using portable LED devices.

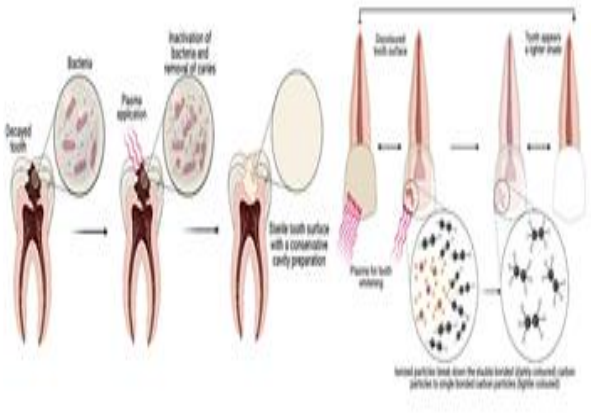
KEYWORDS: Emerging trends in restorative dentistry, resin impregnation and cold plasma, LASER toothbrush, ionic toothbrush, anti-caries mints, At-home bleaching using portable LED devices, Dental robot, Intellidrug.

INTRODUCTION

The dawn of emerging trends in restorative dentistry heralds a profound evolution in field, marked by a fusion of groundbreaking technologies and avant-garde methodologies. This epoch witnesses the convergence of traditional conservative approaches with pioneering innovations, promising a renaissance in patient-centric care. As dental science embarks on a trajectory of continual advancement, practitioners are empowered by a vast array of cutting-edge tools and techniques, transcending the boundaries of conventional treatment modalities.

Cold plasmas

Cold plasma technology, a partially ionized gas, offers a trailblazing approach to dental cavity preparation, providing numerous benefits in terms of patient comfort, antimicrobial efficacy, and precision. Cold plasma operates at near-room temperature and without direct contact, significantly reducing discomfort and eliminating the fear associated with dental drills.[1]



The reactive species generated by cold plasma, such as reactive oxygen and nitrogen species are highly effective

by providing antimicrobial action, as it ensures thorough sterilization of cavity, reducing the risk of infection and improving longevity of dental restorations. Since it is a vaporous medium, Plasma can enter unpredictable pits, fissures, and crevices which subsequently leads to effective removal of dental decay.[2]

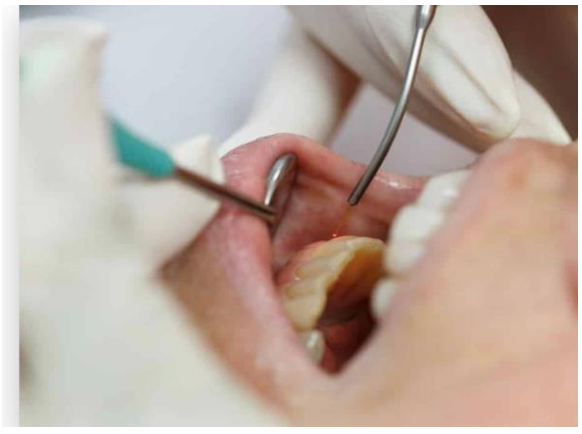
Resin impregnation

Resin impregnation is a conservative, minimally invasive restorative technique intends to manage smooth surface and proximal lesions with low viscosity resin such as resorcinol formaldehyde. It is a 3-step procedure of etch, dry and impregnate.[3]

The resin's low viscosity allows it to infiltrate porous microstructure created by carious demineralization or enamel hypomineralization.[3]

Lasers

LASER technology offers a sophisticated and precise approach to cavity preparation by enhancing patient comfort, antimicrobial efficacy, precision and tissue preservation.



The use of lasers for cavity preparation and caries removal is based on the ablation mechanism, in which dental hard tissue can be removed by thermal and/or mechanical effect during laser irradiation (Seka et al., 1996). The most frequent laser systems used in dental hard tissues are Nd:YAG, Argon Er:YAG, Er-Cr:YSGG, Diode and CO_2.[4]

Cryoanesthesia

It is a drug-free and pain-free alternative. In this method, mouthpiece is filled with saline solution and frozen in a medical-grade freezer. One application of gumEase lasts for 20 minutes which is said to relieve 90% of a patient's pain within 2-3 min. This modality involves the application of extremely low temperatures to dental tissues to achieve a reversible cessation of nerve conduction, effectively rendering area insensate to pain stimuli which mitigates the risk of allergic reactions and systemic toxicity often associated with conventional anesthetics.[5]

Dermojet

The Dermojet, a needle-free injector, has emerged for precise administration of local anesthetics and regenerative biomaterials. It is a high-velocity pneumatic jet-gun injector which administers local anesthetic solution with pressure instead of needle into gingival and mucosal tissues, ensuring accelerated healing by reducing postoperative complications.

Elective aesthetics

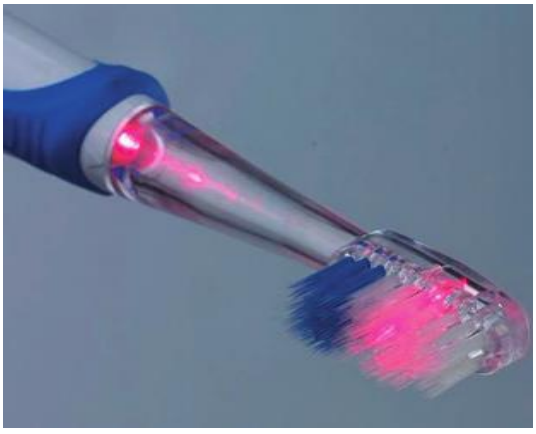
Elective aesthetics give the patient more confident smile with self-expression. Tooth tattoos and jewellery refer to cosmetic markings made on crowns and not on natural teeth. The tooth will be sealed so that tattoo is protected from saliva and erosion. Versatility of dental tattoos lies in its easy removal at any point of time by removing superficial layers of the crown.[6]

Colored composites

These are trending innovations mainly for children where integrity of composites is preserved with addition of colors to modernize esthetics. It acts as adjunct and is the most artistic way of expression for children who are not willing to go for traditional restorative materials.[7]

Laser toothbrush

It is the world's first semiconductor medical toothbrush that utilizes low-level laser therapy which treats dentin hypersensitivity and alleviates toothaches. All functions of laser toothbrush are controlled by a built-in micro-computer.[8]



Emitting specific wavelengths, this device decontaminates oral cavity by targeting pathogenic biofilms and promoting tissue regeneration.

Ionic toothbrushes

Ionic toothbrush relies on the physics of positive and negative charge. Utilizing negative ion emission, these toothbrushes disrupt bacterial adhesion to enamel and dentin surfaces, thereby reducing biofilm accumulation, as it minimizes plaque-induced periodontal complications around restorative margins.[9]

Anti-caries mints

It is a chewable confectionery which contains potent amount of anti-cariogenic enzymes such as amylase, oxidoreductases, a non-cariogenic sweetener and a softening agent. These mints are wholesome as prolonged contact with tooth surface is achieved which eventually releases enzymes and coats the tooth surfaces.[10]

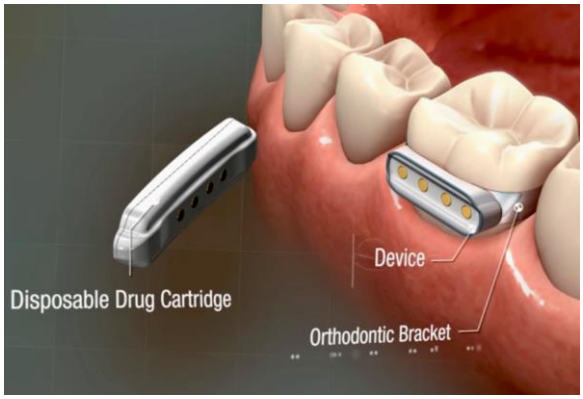
Intraoral camera (IOC) and home LED tooth bleaching

IOC has diverse applications in oral health care as it can be used for periodic self-assessment by the patient and has excelled in field of tele-dentistry. IOC can also be used as a potential dental education aid which facilitates meticulous diagnostic acumen by enabling identification of carious lesions, fractures, marginal discrepancies, and suboptimal restorations that may otherwise elude detection via conventional visual inspection. Furthermore, it serves as an invaluable tool for enhancing patient education and engagement.[11]

The reactive oxygen species in LED penetrate enamel and dentin, oxidizing chromogenic substances that cause discoloration. This is particularly pertinent in cases where achieving a uniform shade is paramount for aesthetic outcomes, especially in restorative work involving veneers, crowns, or composite resins.[12]

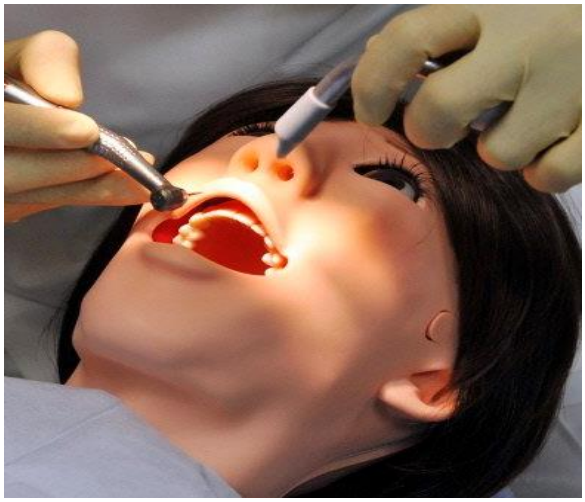
Intellidrug

It is a controlled, personalised, non-invasive system which delivers pharmaceuticals directly into blood stream by mechanism of osmosis using patient saliva. Parts of Intellidrug includes orthodontic bracket, disposable drug cartridge and cradle shaped device. The drugs are dispensed in a highly controlled manner, governed by pre-programmed electronic controls and sensors that respond to physiological triggers or external commands.[13]



Interactive training robot

It is a multi-faceted training system combined with an interactive simulation system that closely mimics typical human behaviours such as facial expressions, limb movements, as well as speech.



It is designed to revolutionize pedagogical approach in the intricate field of restorative procedures as it employs a high-fidelity haptic feedback mechanism, allowing practitioners to experience realistic tactile sensations akin to actual dental tissues.[14]

CONCLUSION

Embracing these innovations promises to revolutionize the field, fostering a dynamic landscape where tradition meets innovation, ultimately redefining standard of dental care. As restorative dentistry continues to evolve, an understanding of emerging trends becomes crucial for practitioners seeking to deliver optimal, patient-centric care in modern dental landscape.

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