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Editorial

We are approaching the last part of the year 2017. On behalf of the editorial team of our journal; I would like to wish all the authors and readers a wonderful year ahead.

All things good or bad, has to end: but learning never ends. Any branch of science develops itself only by liberal and diligent contributions from authors and reviewers. For decades, clinicians and researchers have worked individually, selecting the parameters which they have found valid and important.

Good quality scientific publications benefit health professionals as well as patients. Our editorial team has been highly successful in bringing up the most recent advances in the field of dentistry through this institutional journal. I wish them continued success and also suggest that they should broaden the scope of this scientific publication by spreading the circulation to other institutions across the country. The stringent standards for scientific publication should be strictly adhered to improve the quality of published scientific work. In the spirit of continuous improvement, any constructive input on streamlining our processes is welcome

I sincerely hope that in the coming issues, the journal will provide more innovative ideas and there by widen the horizons of our learning.

Once again, wishing all of you a happy, successful and prosperous year 2018...

Dr. Manoj Kumar K. P.
Principal

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AUTOLOGOUS BONE GRAFTING FOR BONY DEFECTS

*Dr. Jaseem Muhammed, **Dr.Benny Joseph

Abstract

Autologous bone grafts, also called autografts, are bone grafts transferred from one site to another site within the same individual. These grafts are the gold standard to which all other grafting materials are compared because they possess all characteristics of bone growth like osteogenesis, osteoinduction, and osteoconduction. Because they are from the host itself, there is also an absence of antigenicity. Bone, which has been lost as a result of excision, resorption or sequesterization, will not repair by normal process of healing. So they are to be replaced by means of alloplast, bone grafts or its substitutes, bone transport. In this article we are discussing a clinical case of harvesting autologous bone graft from mandibular parasymphysis for a bony defect in maxillary canine region.

Key Words: grafting, mandibular parasymphysis, osteotomy

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Introduction

Successful Osseo integration of dental implants requires sufficient bone surrounding the implant. Although bone substitutes and augmentation techniques offer viable prognoses for achieving the required amount of hard tissue augmentation, autologous bone is the gold standard with regard to quantity, quality, and an uneventful healing.

The limitation of using autologous bone is harvesting adequate bone for reconstruction without exceeding acceptable donor site morbidity. The choice of donor site depends largely on the quality, quantity, and form of the bone required. The amount of time required and the accessibility of the donor site must also be considered. Intraoral bone harvesting has the advantage of being performed in the same operative field and being carried out on an outpatient basis with the patient under local anesthesia.[1]

The mandibular donor site is one of the alternative sources of membranous bone, which is thought to undergo less resorption than endochondral bone.[2-4]In addition to quick bone harvesting with minimal morbidity, the intraoral bone harvesting techniques do not cause cutaneous scarring. The advantages of using mandibular donor site for bone grafting are increased bone volume and quality (bone density) of recipient site. Increased bone density of the recipient site is replicated from symphysis (bone density D-1 and D-2) or ramus (D-I) as donor sites with minimal bone resorption (0%–20%).[5] Different autologous-bone donor sites can serve this purpose. Small bone blocks harvested from the mandibular body, ascending ramus, symphysis, or posterior maxillary region are common donor sites.

In this article we are going to discuss a clinical case of autologous bone graft from mandibular parasymphysis region.

Case report

A 24 year old male patient reported to the department with the chief complaint of missing upper left front tooth since 1 year. On examination he was found with missing of 23. On further intraoral examination a bony defect was palpated on the labial surface of 23. For further evaluation and possibility of placing an dental implant in relation to 23 a CBCT was taken. The CBCT showed an oval-shaped well-defined loss of labial and palatal cortical plates irt 23 region, of diameter approximately 2.13 mm, at a distance of 7.85 mm from the alveolar crest. The impression of CBCT confirmed a bony defect/ fenestration which needed bone grafting before placement of the implant. After clinical and radiological interpretations we decided to do an autologous bone grafting from mandibular parasymphysis region.

Procedure

After administration of LA infiltration sulcular incision is made irt 22 to 25 and mucoperiosteum is elevated and the bony defect is exposed. The dimension of the defect is measured. The wound is packed with gauze. As discussed earlier, we have planned to take the bone graft from mandibular symphysis region. After giving L.A infiltration, sulcular incision was made from 43 to 31 and mucoperiosteum was elevated. The amount of bone to be removed is done in accordance with the previously measured dimension of the bony defect or the amount of bone available for harvesting is sufficient for defects measuring up to the width of 3 teeth.

Osteotomy is made 5mm below the root apices. The osteotomy of the mandibular symphyseal region was marked by penetrating a small round and fissure bur at the labial cortical plate. A thin chisel was used for completing the osteotomy. A free bone block graft was harvested in the form of a cortico-cancellous bone block and transferred carefully to the defect site. The graft is fixed over the defect using 1.5mm bicortical stainless steel screws. The graft was completely stable after fixation. After achieving hemostasis the wound was closed by resorbable sutures.

Regular follow-up was done. Sutures were after 2 weeks. Post-operative swelling was minimal. The osseointegration time for the graft was 6 months.


Fig 1:Pre operative bony defect

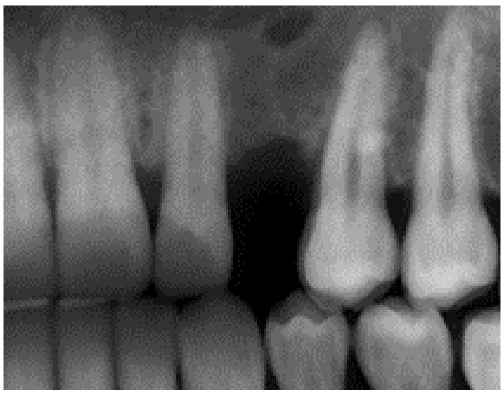
Fig 2:Bony defect irt 23


Fig 3: 3D reconstruction


Fig 4: Fenestration irt 23


Fig 5: Bony defect exposed


Fig 6: Donor site

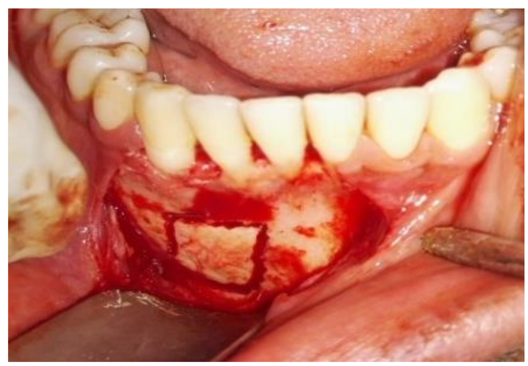
Fig 7: Graft osteotomized


Fig 8: Fixation of harvested graft

Discussion

Autologous bone grafts are widely used in the reconstruction of osseous defects in the oral and maxillofacial region. These are generally obtained from the ilium, the rib, and the calvarium, but each site has associated morbidity. The maxilla and mandible are alternative sources of membranous bone and are thought to undergo less resorption than endochondral bone.[6] A variety of local bone grafts, such as mandibular symphysis, mandibular body, mandibular ramus, and coronoid process, have been used in oral and maxillofacial reconstruction.[7]Intraoral bone donor sites are excellent alternatives for the augmentation of edentulous alveolar defects before implantation.. Intraoral bone can be harvested quickly with minimal morbidity. In addition, because of the intraoral approach no cutaneous scarring occurs. Thus, different sites in the mandible have been used successfully in a variety of clinical applications. However, the position of the vital structures including teeth, maxillary sinuses, and mental and inferior alveolar nerves must be considered and can limit intraoral bone harvesting techniques. Alternative sources for local harvesting in the mandible can be evaluated by careful clinical and radiographic examinations of the patient.

Conclusion

Reconstructive technique and materials have enhanced the ability to correct the bony defects. Based on experimental laboratory procedures and clinical experience, it is possible to offer an overall evaluation of the surgical use of most of the types of bone graft materials. An understanding of the physiology of bone transfer and bone healing and the knowledge of bone survival following transfer will provide the basis for achieving better results in clinical application.

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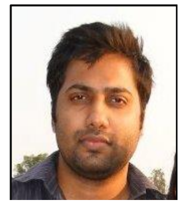
ANTIBIOTIC USE IN DENTAL PRACTICE



*Dr. Ananth Chams, *Dr.Aswathi Vinod,**Dr.Manoj Kumar KP

Abstract

Dentist use of antibiotics is characterized by a number of particularities. In effect, antibiotic prescription is empirical, i.e., the clinician does not know what microorganism is responsible for the infection, since pus or exudate cultures are not commonly made. Based on clinical and bacterial epidemiological data, the germs responsible for the infectious process are suspected, and treatment is decided. The present study reviews antibiotic use in dental practice, and contributes elements to favor the rational use of such medicines.

Key Words: antibiotics, analgesics, dentistry

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Introduction

Antibiotic treatment is an aspect of pharmacotherapy with the particularity of affording both etiological and curative action. It was introduced in the mid-twentieth century in the form of sulfa drugs (1935), penicillin (1941), tetracyclines (1948) and erythromycin (1952). Since then, antibiotics have focused much clinical and pharmacological research, in response to the progressive challenges posed by bacterial infections: identification of new pathogens, the development of resistances to antibiotics, the consolidation of new diseases, and novel clinical situations (increase in chronic processes, survival of patients with disorders considered to be fatal until only recently, etc.).[1]

A good example of the usefulness of these drugs is provided by the fact that in the period 1998-2000, the number of daily doses of antibiotics per 1000 inhabitants was 30.7 with a cost of 47.18 euros/1000 inhabitants/ day. Furthermore, in Spain during the year 2004, the public National Health Care System prescribed 25.61 million containers of macrolides, combinations of penicillins, other betalactams and fluorquinolones, with a total cost of 336.12 million euros.[2] The fact that no antibiotic is included among the 35 most widely consumed generic drug products during the year 2004 is misleading. This is because antibiotics are generally prescribed for acute episodes and for brief periods of time, while the most heavily consumed medicines are those prescribed for chronic processes (antihypertensive agents, hypolipidemic drugs, antacids, anti-inflammatory drugs, bisphosphonates, bronchodilators, etc.).

Bacterial infections are common in dental and oral clinical practice; as a result, antibiotic use prescribed for their treatment is also frequent. In Spain, it has been estimated that odontogenic infections are the cause of 10% of all antibiotic prescriptions.[3]

Table1. Antibiotics commonly used in application to odontogenic infections

Drug substance	Administration route	Posology	Side effects
Amoxicillin	po*	500 mg/8 hours 1000 mg/12 hours	Diarrhea, nausea, hypersensitivity reactions
Amoxicillin-clavulanic acid	po or iv **	500-875 mg/8 hours* 2000 mg/12 hours* 1000-2000 mg/8 hours**	Diarrhea, nausea, candidiasis, hypersensitivity reactions
Clindamycin	po or iv	300 mg/8 hours* 600 mg/8 hours**	Pseudomembranous colitis
Azithromycin	po	500 mg/24 hours 3 consecutive days	Gastrointestinal disorders
Ciprofloxacin	po	500 mg/12 hours	Gastrointestinal disorders
Metronidazole	po	500-750 mg/8 hours	Seizures, anesthesia or paresthesia of the limbs, incompatible with alcohol ingestion
Gentamycin	im*** or iv	240 mg/24 hours	Ototoxicity Nephrotoxicity
Penicillin	im or iv	1.2-2.4 million IU/24 h*** Up to 24 million IU/24 hours**	Hypersensitivity reactions, gastric alterations

*po:oral route; **iv:intravenous route; *** im:intramuscular route.

In the Valencian Community (Spain), dentists in the public health care system during the year 2005 prescribed a total of 43,490 antibiotic containers, with a total cost of 274,439.82 euros. In relative terms, these figures represent 0.94% of the total antibiotic containers and 0.51% of the total antibiotic expenditure generated by the public health care system in the Valencian Community.

By pharmaceutical specialties or drug products, amoxicillin and the association amoxicillin-clavulanic acid accounted for 67.8% of all prescriptions and 59.4% of the global cost. The association amoxicillin-clavulanic acid was the most frequently prescribed treatment, representing 38.7% of all prescriptions and 45.7% of the net cost. Spiramycin and the association spiramycin and metronidazole in turn accounted for 13.34% of the prescriptions and 10.2% of the global expenditure. Lastly, clindamycin represented 4% of the prescriptions and 4.2% of the costs. In sum, three drug substances and two drug associations or combinations of these same three drug substances account for 95% of all antibiotic prescriptions made by dentists in the context of the public health care system, and 75% of the total antibiotic cost.

The present study reviews antibiotic use in dental practice, and contributes elements to favor the rational use of such medicines.

Particularities of antibiotic use in dental and oral clinical practice

Dentist use of antibiotics is characterized by a number of particularities. In effect, antibiotic prescription is empirical, i.e., the clinician does not know what microorganism is responsible for the infection, since pus or exudate cultures are not commonly made. Based on clinical and bacterial epidemiological data, the germs responsible for the infectious process are suspected, and treatment is decided on a presumptive basis, fundamental on probabilistic reasoning.[4]

As a result of the above, broad spectrum antibiotics are typically prescribed. A broad range of organisms can be isolated from the oral cavity, and although not all of them are potential human pathogens, the list of bacteria related with oral infections is relatively long (cocci, bacilli, grampositive and gramnegative organisms, aerobes and anaerobes).

As has been commented above, a very limited range of drug products is typically used – sometimes as few as two or three antibiotics. In turn, prescription is characteristically made for short periods of time – typically no more than 7-10 days. The antibiotic sensitivity of the bacteria found within the oral cavity is gradually decreasing, and a growing number of resistant strains is detected – particularly Porphyromona and Prevotella,[5] though the phenomenon has also been reported for Streptoccocus viridans and for drugs such as the macrolides, penicillin and clindamycin.[6,7]

Antibiotic prescription is almost invariably associated with the prescription of non steroidal anti inflammatory drugs (NSAIDs). There are many potential interactions between these two drug categories – the most common situation being an NSAID-mediated reduction of antibiotic bioavailability and thus effect,[8.9] though some combinations of drugs such as cephalosporins and ibuprofen, or tetracyclines with naproxen or diclofenac, have been shown to exert the opposite effect, i.e., an increase in the bioavailability of the antibiotic.[10,11]

Indications of antibiotic treatment

The drawback to the evident benefits of antibiotic treatment is represented by the undesired effects of their use.[12] On one hand there are side effects with repercussions for the patient, such as gastric, hematological, neurological, dermatological, allergic and other disorders. On the other hand, the development of bacterial resistances is of great importance for both individual patient and public health – the paradigm in this case being the ß-lactamase producing bacterial strains. As was demonstrated by Kuriyama et al.[13], ß-lactamase producing bacteria are isolated with increased frequency from the purulent exudate of odontogenic infections in patients that have received previous treatment with beta-lactams, and the longer the duration of such prior treatment the greater the number of resistant bacterial strains isolated.

Rational antibiotic use is thus required in dental and oral clinical practice, to ensure maximum efficacy while at the same time minimizing the side effects and the appearance of resistances. Antibiotics are typically prescribed in dental practice for some of the following purposes: (a) as treatment for acute odontogenic infections; (b) as treatment for non-odontogenic infections; (c) as prophylaxis against focal infection in patients at risk (endocarditis and joint prostheses); and (d) as prophylaxis against local infection and systemic spread in oral surgery.

Treatment of the acute odontogenic infection

Despite the high incidence of odontogenic infections, there are no uniform criteria regarding the use of antibiotics to treat them. Bascones et al.,[14] in a consensus document on the subject, suggested that treatment should be provided in some acute situations of odontogenic infection of pulp origin as a complement to root canal treatment, in ulcerative necrotizing gingivitis, in periapical abscesses, in aggressive periodontitis, and in severe infections of the fascial layers and deep tissues of the head and neck.

They do not recommend antibiotic treatment in chronic gingivitis or periodontal abscesses (except in the presence of dissemination).

There is considerable agreement that the beta-lactam derivatives are the antibiotics of choice for these processes, provided there are no allergies or intolerances. However, there is less consensus regarding which drug belonging this family should be prescribed. While some authors consider the natural and semisynthetic penicillins (amoxicillin) to be the options of first choice[15], others prefer the association amoxicillin-clavulanate, due to the growing number of bacterial resistance, as well as its broad spectrum, pharmacokinetic profile, tolerance and dosing characteristics. [16] As has been commented above, some authors have proposed clindamycin as the drug of choice, in view of its good absorption, low incidence of bacterial resistances, and the high antibiotic concentrations reached in bone.

Prophylaxis of focal infection

The use of antibiotics as prophylaxis for focal infection is common practice, and has been widely accepted in the dental profession. The paradigm of this model of treatment is the prevention of bacterial endocarditis, indicated in risk patients in the context of any invasive procedure within the oral cavity – and following the guidelines of the American Hearth Association (AHA) [17] (Table 2).

Nevertheless, there are doubts in relation to this practice. Firstly, transient bacteremia occurs not only after dental treatments such as extractions (35-80%) or periodontal surgery (30-88%). It also occurs in the context of tooth brushing (40%) or while chewing gum (20%), and is proportional to the trauma caused and to the number of germs colonizing the affected zone. Secondly, not only bacteria cause endocarditis, and of those that do cause the disease, many are resistant to the antibiotics administered as prophylaxis (fundamentally amoxicillin). Lastly, it is known that most cases of bacterial endocarditis are not related with invasive procedures, and that dental care is only responsible for a minimum percentage of cases of the disease.

Table 2. Antibiotic prophylaxis against bacterial endocarditis in oral procedures (AHA)

Antibiotic	Indication	Dose	Timing
Amoxicillin	Standard	2 g po, *50 mg/kg po	1 hour before
Ampicillin	If oral route cannot be used	2 g im or iv, *50 mg im or iv	½ hour before
Clindamycin	Allergy to penicillin Allergy to penicillin and oral route cannot be used	600 mg po, *20 mg/kg 600 mg po or iv, *20 mg/kg iv	1 hour before ½ hour before
Cephalexin or cefadroxil	Allergy to penicillin	2 g po, *50 mg/kg po	1 hour before
Azithromycin or clarithromycin	Allergy to penicillin	500 mg po, *15 mg/kg po	1 hour before
Cefazolin	Allergy to penicillin and oral route cannot be used	1g im or iv, *25 mg/kg	½ hour before

*pediatric dose; *po:oral route; **iv:intravenous route; *** im:intramuscular route.

Despite the mentioned inconveniences, antibiotic prophylaxis is still recommended in patients at risk. However, the results of a survey conducted by Tomas-Carmona et al.[18] on the knowledge and approach to the prevention of bacterial endocarditis among Spanish dentists showed that fewer than 30% of the professionals were aware of correct antibiotic indications and posology.

There is no scientific basis for recommending systematic antibiotic prophylaxis prior to invasive dental treatment in patients with total joint prostheses. Jacobson published a study on 2693 patients with total joint replacement (hip or knee). In 30 of the patients he detected infection of the prosthesis, and in only one case was a time relationship with prior dental treatment established. Furthermore, 54% of the germs isolated were Staphylococcus aureus and epidermidis.[19]

According to the American Dental Association and the American Academy of Orthopedic Surgeons, evaluation is required of antibiotic prophylaxis in patients with total joint prostheses in the presence of immune deficiency, when contemplating high risk dental procedures in patients with prostheses in place for less than two years, and in patients who have already suffered past joint prosthesis infections.[20]

Prophylaxis of local infection and systemic spread

Prophylaxis of local infection is taken to comprise the administration of antibiotics on a pre-, intra- or postoperative basis, to prevent bacterial proliferation and dissemination within and from the surgical wound. Few clinical studies to date have evaluated this type of treatment. Some authors have reported its efficacy, with statistically significant differences in the frequency of infectious complications in surgical extractions of lower third molars between patients who had received some form of antibiotic treatment and those without.[21]

In a consensus document on the use of antibiotic prophylaxis in dental surgery and procedures published in 2006,[22] prophylaxis in oral surgery in a healthy patient was only recommended in the case of the removal of impacted teeth, periapical surgery, bone surgery, implant surgery, bone grafting and surgery for benign tumors. In subjects with risk factors for local or systemic infection - including oncological patients, immune suppressed individuals, patients with metabolic disorders such as diabetes, and splenectomized patients, prophylactic antibiotic coverage should be provided before attempting any invasive procedure.

The use of antibiotics in endodontics should be reserved for patients with signs of local infection, malaise of fever. Prophylactic or preventive use should be reserved for endocarditis and the systemic disorders commented above – avoiding indiscriminate antibiotic use.[23]

Precautions with antibiotic use

Pregnancy

The legal and ethical impossibility of conducting clinical trials in humans to evaluate the risks of antibiotic treatment during pregnancy has given rise to uncertainties as to the use of such drugs in these patients. The United States Food and Drug Administration (FDA) has established four levels of drug risk during pregnancy: (A) without demonstrated risk; (B) without effects in animals, though with undemonstrated innocuousness in humans; (C) no studies conducted in either animals or humans, or teratogenic effects recorded in animals without due evaluation in humans; and (D) teratogenic effects upon the fetus – use of the drug being conditioned to the obtainment of benefit that outweighs the risks. A final group (X) in turn contemplates teratogenic effects that outweigh any possible benefit derived from the drug.

No antibiotic corresponds to group A. On the other hand, group B (i.e., warranting caution with treatment during pregnancy) contains the following antibiotics: azithromycin, cephalosporins, erythromycin, metronidazole and penicillins with or without beta-lactamase inhibitors. Group C in turn includes clarithromycin, the fluorquinolones and the sulfa drugs (including dapsone). Finally, group D contains the aminoglycosides and tetracyclines.[24]

Kidney failure

Many antibiotics are actively eliminated through the kidneys. The presence of impaired renal function requires reduction of the drug dose in order to avoid excessively elevated plasma drug concentrations that could lead to toxicity. dose adjustment can be carried out by reducing the amount administered in each dose or by increasing the interval between doses (without modifying the amount of drug). Neither approach has been shown to be superior.[25]

Table 3 reports some of the antibiotics most frequently used in dental practice, with the dose adjustments required according to the degree of kidney failure (assessed according to creatinine clearance).

Table 3: Dose adjustment of antibiotics most commonly used in dental practice, in patients with chronic kidney failure, according to creatinine clearance.

Drug	Normal dose	Dose with creatinine clearance 10-50 ml/min.	Dose with creatinine clearance <10 ml/min.
Amoxicillin	500/1000 mg/8h	Every 8-12 h	Every 12-14 h
Amoxicillin-clavulanate	500-875 mg/8h	Every 8 hours	Every 12-24 hours
Clindamycin	300 mg/8h	No adjustment needed	No adjustment needed
Doxycycline	100 mg/24h	No adjustment needed	No adjustment needed
Erythromycin	250-500 mg/6h	No adjustment needed	No adjustment needed
Metronidazole	250-500 mg/8h	Every 8-12 hours	Every 12-24 hours
Penicillin G	0.3-1.2 million IU/6-12 h	50-100% of the dose every 8-12 hours	25-50% of the dose every 12 hours
Azithromycin	500 mg/24h 3 days	No adjustment needed	No adjustment needed

Liver failure

Some antibiotics are metabolized in the liver, followed by elimination in bile. In patients with liver failure, the use of such antibiotics should be restricted in order to avoid toxicity secondary to overdose. Erythromycin, clindamycin, metronidazole and anti-tuberculosis drugs are antibiotics requiring dose adjustments when administered to patients with liver failure.

Regardless of the above considerations, some antibiotics are potentially hepatotoxic. As a result, and whenever possible, they should be avoided in patients with some active liver disorder. Specifically, tetracyclines and anti-tuberculosis drugs should be avoided.[26]

Conclusion

Bacterial infections are common in dental and oral clinical practice; as a result, antibiotic use prescribed for their treatment is also frequent. Rational antibiotic use is thus required in dental and oral clinical practice, to ensure maximum efficacy while at the same time minimizing the side effects and the appearance of resistances.

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'PERI-OZONE' - OZONE THERAPY IN PERIODONTICS

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Abstract

Gingival and periodontal diseases are two globally leading oral afflictions where bacteria play an important role in its etiopathogenesis. Ozone therapy is successfully being used in the medical field for treatment of various diseases. The versatility of ozone therapy, its unique properties, noninvasive nature, absence of side effects or adverse reactions are responsible for its wide spread use. The use of ozone in dentistry has been proposed because of its antimicrobial, disinfectant, biocompatibility and healing properties. Ozone gas has a high oxidation potential and has the capacity to stimulate blood circulation and the immune response. It can be used for the treatment of periodontitis, as a mouthwash for reducing the oral micro flora, as well as in the cases of periimplantitis.

Key Words: Ozone therapy, periodontics, uses

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Introduction

Periodontitis is defined as an "infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss, and bone loss".[1] Plaque accumulation on tooth and gingival surfaces at the dentogingival junction is considered the primary initiating agent in the etiology of gingivitis and chronic periodontitis.

Humans have evolved to have an intimate and dynamic relationship with microorganisms; this includes those that make up the resident microbiota of all environmentally exposed surfaces of the body as well as those that cause disease. Contemporary studies are demonstrating that the relationship with the resident microbiota is highly interactive, and makes a major contribution to the health of the host .[(2)] These microbiotas have a diverse composition, and function as interactive microbial communities in which their combined properties are greater than the sum of the activities of the constituent species. These communities, and those present at other habitats in the body, play an active and critical role in the normal development of the host and in the maintenance of health.[2]

The mechanical debridement of the biofilm and adjunctive use of antibiotics, disinfectants or various chemotherapeutic agents have been the conventional methods for periodontal therapy.[3] Ozone therapy is one of the modern non-medication methods of treatment which is found to be effective due to its antimicrobial effect.

History

The word ozone originates from the Greek word "Ozein", whichmeans odor and was first used by German chemist Christian Friedrich Schonbein, "Father of ozone therapy" in 1840.In 1856, just 16 years after its discovery, ozone was first used in a health care setting to disinfect operating rooms and sterilize surgical instruments. By the end of the 19th century the use of ozone to disinfect drinking water of bacteria and viruses was well established in mainland Europe.[4]

At that time, ozone therapy was difficult and limited due to the lack of ozone-resistant materials, such as Nylon, Dacron, and Teflon, until 1950 when ozone-resistant materials were manufactured. Joachim Hänsler, a German Physicist and Physician, joined another German Physician, Hans Wolff, to develop the first ozone generator for medical use. Their design continues to be the basis for modern equipment.

Chemistry and Specific characteristics of Ozone

Ozone is a triatomic molecule and exists as colourless gas with a pungent odour at room temperature, detectable at concentrations as low as 0.02 to 0.05 ppm. It is a highly corrosive, toxic and a powerful oxidant. Ozone exists in the atmosphere. The highest levels are in stratosphere in the region known as the ozone layer between 10 and 50 km above the sea level. In nature, ozone is also commonly found as a result of lightning strikes during thunderstorms and waterfalls. Ozone absorbs dangerous B and C ultraviolet radiations making it very useful, yet it can be also very toxic for the pulmonary tract especially when it mixes with carbon monoxide (CO), N2O and traces of acids as it occurs in smog.[5]

Ozone (O3) is naturally produced by the photo dissociation of molecular oxygen (O2) into activated oxygen atoms, which then react with further oxygen molecules. This transient radical anion rapidly becomes protonated, generating hydrogen trioxide (HO3), which, in turn, decomposes to an even more powerful oxidant, the hydroxyl radical (OH).

Ozone Generators

The first ozone generator for medical use was developed by German physicians named Joachim Hansler and Hans Wolff. There are three different systems for generating ozone gas:

- **Ultraviolet System**: produces low concentrations of ozone, used in esthetics, saunas, and for air purification.
- **Cold Plasma System**: used in air and water purification.
- **Corona Discharge System**: produces high concentrations of ozone. It is the most common system used in the medical/ dental field. It is easy to handle and it has a controlled ozone production rate[5]

Biological actions [6]

There are several known actions of ozone on human body, such as immune stimulating and analgesic, anti-hypoxic and detoxicating, antimicrobial, bioenergetic and biosynthetic (activation of the metabolism of carbohydrates, proteins, lipids) etc.

1. Antimicrobial effect

Ozone works destructively against bacteria, fungi, and viruses. The antimicrobial effect of ozone is a result of its action on cells by damaging its cytoplasmic membrane due to ozonolysis of dual organelle function) because of secondary oxidants effects. This action is non-specific and selective to microbial cells; it does not damage human body cells because of their major antioxidative ability.

2. Immunostimulating effect

Ozone influences cellular and humoral immune system. It stimulates proliferation of immunocompetent cells and synthesis of immunoglobulins. It also activates function of macrophages and increases sensitivity of microorganisms to phagocytosis. Ozone causes the synthesis of biologically active substances such as interleukins, leukotrienes, and prostaglandins which is beneficial in reducing inflammation and wound healing. Ozone in high concentrations causes immunodepressive effect whereas in its low concentration immunostimulating effect.[6]

3. Antihypoxic effect

Ozone brings about the rise of pO2 in tissues and improves transportation of oxygen in blood, which results in change of cellular metabolism – activation of aerobic processes (glycolysis, Krebs cycle, β-oxidation of fatty acids) and use of energetic resources. Repeating low doses of ozone activate enzymes: super-oxide dismutases, catalases, dehydrogenase, and glutatione peroxidases. They are part of complex enzymatic systems which protect organisms against the action of oxygen-free radicals. It also prevents formation of erythrocytes aggregates and increases their contact surface for oxygen transportation. Its ability to stimulate the circulation is used in the treatment of circulatory disorders and makes it valuable in the revitalizing organic functions. Ozone improves the metabolism of inflamed tissues by increasing their oxygenation and reducing local inflammatory processes. [6]

4. Biosynthetic Effect

It activates mechanisms of protein synthesis, increases amount of ribosomes and mitochondria in cells. These changes on the cellular level explain elevation of functional activity and regeneration potential of tissues and organs. [6]

5. Ozone causes secretion of vasodilators such as NO, which is responsible for dilatation of arterioles and venules. It also activates angiogenesis.[6]

6. Ozone, when acting on the organic substance of mineralized tooth tissues intensifies their remineralization potential. At the same time, it is capable of "opening" dentinal tubules, which enables the diffusion of calcium and phosphorus ions to the deeper layers of carious cavities. [6]

Goals of ozone therapy[7]

1. Elimination of pathogens
2. Restoration of proper oxygen metabolism
3. Induction of a friendly ecologic environment
4. Increased circulation
5. Immune activation
6. Simulation of the humoral anti-oxidant system

Appliances producing ozone for dental use

HealOzone by KaVo is air-based and the application of the gas takes place in a closed circuit. Its surplus is sucked out and neutralized by manganese ions. The concentration of ozone in the cap adjacent to the tissue amounts to 2100 ppm. Perfect air tightness of the cap is necessary for the application of ozone. Therefore, the application is only possible on the surfaces where such air tightness can be provided.

OzonyTron by MYMED Gmb H. Oxygen activation generator (OzonytronX—Biozonix, München, Germany) uses the power of high frequency and voltage. Activated oxygen (ozone) concentration can be adjusted in 5 levels via current strength. Inside the glass probe, which is formed by a double glass camera, is a noble gasses mixture that is conducting and emitting electromagnetic energy. When the tip of the probe gets in contact with the body it emits energy around the treated area and splits environmental diatomic oxygen in singular atomic oxygen and ozone. The concentration of ozone in the operation field is 10 to 100 μg/ml (becomes a fungi-, viru-, and bacteriocide at the intensity of 1–5 μg/ml). There is no closed circuit here, therefore, ozone can be applied to the places that are difficult to reach, e.g. gingival pockets or root canals.

Product photo (Prozone) by W&H It is characterized by its ease of use and safety of application (preset tissue-compatible dosages in the indication areas of periodontitis and endodontitis). Prozone ensures a hygienic procedure during the gassing of the pockets due to its exchangeable plastic attachments (Perio tips or Endo tips).[5]

Route of ozone administration

- **Gaseous Ozone** - Gaseous ozone is most frequently used in restorative dentistry and endodontics. Topical administration of the gaseous form can be via an open system or via a sealing suction system as a prerequisite to avoid inhalation and adverse effects. Ozone appears to be an integral part of noninvasive therapy of dental caries, as a disinfectant prior to placing a direct restoration and as therapy for hypo mineralized teeth.[5]

- **Ozonated Water** - Ozonated water has been shown to be very effective against bacteria, fungi and viruses and is also less expensive compared to other chemical cleaners. Gaseous ozone was shown to be a more effective microbicide than the aqueous form and, applied for 3 min, may be used as a dental disinfectant. Because ozone gas has been found to have toxic effects if inhaled into the respiratory tract, ozonated water may be useful to control oral infections and various pathogens.[5]
- **Ozonized Oil** - In addition to ozone application in its gaseous and aqueous form, sunflower ozonized oil also seems extremely convenient. The wide accessibility of sunflower oil makes it a competitive antimicrobial agent. Ozonized oil (Oleozone, Bioperoxoil) has shown to be effective against Staphylococci, Streptococci, Enterococci, Pseudomonas, Escherichia coli and especially Mycobacteria and has been utilized for the cure of fungal infections.[8]

Ozone therapy in Periodontics

The main use of ozone in dentistry relays on its antimicrobial properties. It is proved to be effective against both Gram positive and Gram negative bacteria, viruses and fungi. [9] Ozonated water (4 mg/l) was found effective for killing gram-positive and gram-negative oral microorganisms and oral Candida albicans in pure culture as well as bacteria in plaque biofilm and therefore might be useful as a mouth rinse to control oral infectious microorganisms in dental plaque.[10]

Various studies have proved the efficacy of Ozone in relation to its antimicrobial activity:

Dental plaque samples when treated with 4mL of ozonated water is effective in killing gram-positive and gram-negative oral microorganisms and oral Candida albicans in pure culture as well as bacteria in plaque biofilm and therefore might be useful to control oral infectious microorganisms in dental plaque.[8]

Periodontal pockets when irrigated by ozonized water arefound to have significant improvement regarding pocket depth, plaque index, gingival index and bacterial count. It is reported significant reduction in bacterial count in sites treated with ozonized water.[8]

The effect of ozone on host immune response suggested that TNF-kappaB activity in oral cells in periodontal ligament tissue from root surfaces of periodontally damaged teeth was inhibited following incubation with ozonized medium. It was also found that aqueous ozone exerts inhibitory effects on the NF-kappaB system, suggesting that it has an anti-inflammatory capacity.[8]

The influence of ozonized water on the epithelial wound healing process in the oral cavity suggested that ozonized water applied on the daily basis can accelerate the healing rate in oral mucosa which can be seen in the first two postoperative days. The comparison with wounds without treatment shows that daily treatment with ozonized water accelerates the physiological healing rate.[8]

Effect of ozone therapy on periimplantitis treatment was found to be effective in decontaminating the implant surface, its surrounding tissue and thus preventing recolonization with periodontal pathogenic bacteria.[8]

Ozone also have proved efficacy in quick and prompt relief from root hypersensitivity. The desensitization is found to be effective and is found to last for longer time.[8]

Application modalities [8]

According to the clinical case, different applications modalities are available using ozone gas, irrigation with ozonated water and in-office use of ozonized oil as well as home use.

Gas application via a customized thermoformed dental appliance- A customized suckdown thermoformed hard or medium-soft dental appliance can be prepared. It should extend 2-3 mm beyond the affected gingival area, leaving a free space for gas circulation. 2 ports should be attached for the gas inlet and outlet respectively at the distal and mesial of the treatment area. The edges of the appliance should be reclined with light or medium body silicone. Light-cured dam can also be applied as an extra safety precaution to completely seal the borders. The ports to the generator and the suction pump should then be attached. This procedure will treat both hard and soft tissues of the affected area. PVC or silicone cap can be used to treat individually all the indicated areas in difficult situations where such an appliance is hard to use or uncomfortable to the patient.

Irrigation with Ozonated Water- Ozonated water can be used to irrigate the affected area during and after scaling, root surface planning, and non-surgical pocket curettage.

In-office and Home Use of Ozonized Olive Oil- After in-office treatment with ozone gas or ozonated water, pockets can be filled with ozonized olive oil using a blunt 25G needle or any other appropriate tip. Patient can be given some of the oils for home use. In-office ozonized oil application can be repeated once a week.

Surgical Procedures- Ozonated water can be used as an irrigant during the surgical procedure and/or as a final surgical site lavage. The sutures can be covered with a thin layer of ozonized oil and the patient can be instructed to apply the oil 3-4 times a day.

Peri-Implantitis-. Ozone can play an important role and be used as gas or in aqueous form. An appropriate length of PVC or silicone cap can be cut to cover the abutment fully. It should properly seal the gingival borders around the implant. Ozone gas infiltrations can also be used in this situation. Ozonated water can be used as an irrigant during debridement and curettage. Patient can be advised to apply ozonized oil on the treated area 3-4 times/day.

Contraindications[10]

The following are contraindications of ozone therapy:

- Pregnancy
- Glucose- 6- phoshate dehydrogenase deficiency (favism)
- Hyper thyroidism
- Severe anemia
- Severe myasthenia
- Active hemorrhage

Ozone toxicity [8, 10]

Ozone inhalation can be toxic to the pulmonary system and other organs. Complications caused by ozone therapy are infrequent at 0.0007 per application. Known side-effects are epiphora, upper respiratory irritation, rhinitis, cough, headache, occasional nausea, vomiting, shortness of breath, blood vessel swelling, poor circulation, heart problems and at a times stroke. Because of ozone's high oxidative power, all materials that come in contact with the gas must be ozone resistant, such as glass, silicon, and Teflon. However, in the event of ozone intoxication the patient must be placed in the supine position, and treated with vitamin E and n-acetylcysteine.

Conclusion

Dentistry is changing and we use modern science and new technologies to practice dentistry. Ozone in comparison with the traditional treatment modalities is quite inexpensive, predictable and conservative. Treating patients with ozone therapy reduces the treatment time with a great deal of difference and it eliminates the bacterial count more precisely. The treatment is completely painless and increases the patients' acceptability and compliance with minimal adverse effects. The use of ozone therapy proves to be a standard treatment for disinfection of an operation sites in dentistry in coming future.

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COMPOMERS

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Abstract

Dental compomers are materials which are used in dentistry as restorative material. They were introduced in the early 1990s as a hybrid of two other dental materials: dental composites and glass ionomer cement. They are also known as polyacid-modified resin composites. Compomers contain hydrophilic components, and these cause water to be drawn into the material following cure. This triggers an acid–base reaction, and gives the materials certain clinically-desirable properties (fluoride release, buffering capability) that are also associated with glass-ionomer cements. The water uptake leads to a decline in certain, though not all, physical properties. However, clinical studies have shown these materials to perform acceptably in a variety of applications (Class I, Class II and Class V cavities, as fissure sealants), especially in children's teeth.

Key Words: Compomers, glass ionomer cement

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Introduction

Polyacid-modified composite resins, known trivially as compomers, are a group of aesthetic materials for the restoration of teeth damaged by dental caries.[1] They were introduced to the profession in the early 1990s,[2] and were presented as a new class of dental material designed to combine the aesthetics of traditional composite resins with the fluoride release and adhesion of glass-ionomer cements. The trivial name was devised from the names of these two "parent" materials, the "comp" coming from composite, and "omer" from ionomer.[3] Materials that do not have an acid-base reaction and will not set unless exposed to a visible light source are referred to as polyacid-modified resin composites (compomers). Compomer materials have gained acceptance among practitioners due to their handling properties, esthetics, and fluoride release. Mechanical and esthetic properties of composites and fluoride releasing property of glass-ionomer cement were used in the development of Compomer as a dental restorative material.[4] The fluoride released into the mouth by compomer is intended to help protect against future caries It has been shown that compomer does infact release fluoride into the mouth which has a preventive effect against future caries compared with composite materials without fluoride.[5] Studies have concluded that although fluoride-releasing materials, including compomer, inhibit the formation of caries in vitro, such effects have not yet been determined in vivo.

Composition and setting

Compomers were marketed as a new class of dental materials that would provide the combined benefits of composites (the "comp" in their name) and glass ionomers ("omer"). These materials have two main constituents: dimethacrylate monomer(s) with two carboxylic groups present in their structure, and filler that is similar to the ion-leachable glass present in GICs. The ratio of carboxylic groups to backbone carbon atoms is approximately 1:8. There is no water in the composition of these materials, and the ion-leachable glass is partially silanized to ensure some bonding with the matrix. These materials set via a free radical polymerization reaction, do not have the ability to bond to hard tooth tissues, and have significantly lower levels of fluoride release than GICs.

As has already been stated, compomers resemble traditional composite resins in that their setting reaction is an additionpolymerization.[2] It is usually light-initiated, and the initiatorscamphorquinone with amine accelerator, is sensitive to blue light at 470nm.[2] A key feature of compomers is that they contain no water and the majority of components are the same as for composite resins. Typically these are bulky macro-monomers, such as bisglycidyl ether dimethacrylate (bisGMA) or its derivatives and/or urethane dimethacrylate, which are blended with viscosity-reducing diluents, such as triethylene glycoldimethacrylate (TEGDMA). These polymer systems are filled with non-reactive inorganic powders, such as quartz or a silicate glass, for example SrAlFSiO4.[6]

These powders are coated with a silicate to promote bonding between the filler and the matrix in the set material.[3] In addition, compomers contain additional monomers that differ from those in conventional composites, which contain acidic functional groups. The most widely used monomer of this type is so-called TCB, which is a di-ester of 2-hydroxyethyl methacrylate with butane tetra carboxylic acid.[5]This acid-functional monomers very much amino component and compomers also contain some reactive glass powder of the type used in glass-ionomercements.[1]

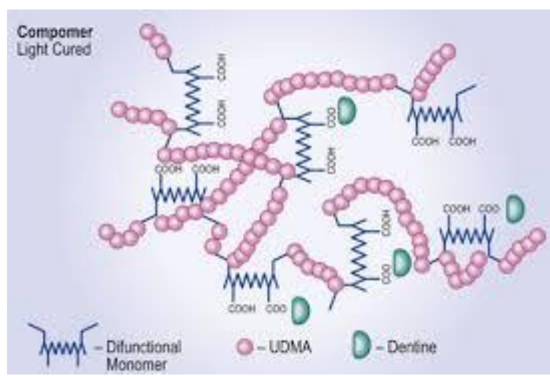

Fig 1 : Compomer

Despite the presence of these additional components, compomers are similar to composite resins in that they are fundamentally hydrophobic, though less so than conventional composite resins. They set by a polymerization reaction, and only once set do the minority hydrophilic constituents drawing a limited amount of water to promote a secondary neutralizationreaction.[6] They lack the ability to bond to tooth tissues [7,8] and their fluoride release levels are significantly lower than those of glassionomercements.[9,10] Such low levels of fluoride release have been shown to compromise the degree of protection afforded by these materials in in-vitro experiments using an artificial caries medium.[11]

A distinctive feature of compomers is that, following the initial polymerization reaction,[12] they take up small amounts of moisture in situ, and this triggers an acid–base reaction between the reactive glass filler and the acid groups of the functional monomer.[3] Among other features, this process causes fluoride to be released from the glass filler to the matrix, from where it can readily be released into the mouth, and act as an anticariogenic agent.[11] Polymerization is associated with contraction and the development of measurable stresses,[13]and it may be that the sorption of water plays some part in reducing these stresses in vivo.

Properties of compomers

Mechanical properties

Compressive, biaxial flexure anddiametral tensile strengths, fracture toughness and surface hardness do not differ much from those of conventional composite resins. One mechanical property of compomers that does differ significantly from those of conventional composite resins however is fracture toughness.[14]

Flouride release

Compomers are designed to release fluoride in clinically beneficial amounts. Fluoride is present in the reactive glass filler, and becomes available for release following reaction of this glass with the acid functional groups, triggered by moisture uptake. In addition, commercial compomers contain fluoride compounds such as strontium fluoride or ytterbium fluoride, which are capable of releasing free fluoride ion under clinical conditions, and augment the relatively low level of release that occurs from the poly salt species that develops. Fluoride release occurs to enhanced extents in acidic conditions, and in lactate buffer has been shown to be diffusion-based.[15] Compomers are blends of glass ionomer and resin composite. They incorporate more resin than the resin-modified glass ionomers, and their physical and mechanical properties are more similar to the fluoride releasing resin composites. These materials release more fluoride than resin composites but less than glass ionomers or resin-modified glass ionomers. Compomers have are charge capacity between that of resin modified glass ionomers and resin composites but more similar to that of resin-modified glass ionomers.[16]

Buffering

Compomers have been found to change the pH of lactic acid storage solutions in the direction of neutral, and to be repeatable when samples were exposed to fresh lactic acid at weekly intervals over a period of 6 weeks. This behavior, so called buffering, has been observed for glass-ionomer cements, but was not found for conventional composites. It's therefore a property conferred by the acid–base components of the compomer.[17,18]

Clinical applications

Compomers are designed for the same sort of clinical applications as conventional composites. These include Class II and Class V cavities, as fissure sealants , and as bonding agents for the retention of orthodontic bands .[19,20,21]They have been widely used and studied in children's dentistry,

Though not exclusively so. Their fluoride release, however, is seen as a useful feature for use in Pedodontics, and certain brands have been produced that are specifically aimed at children. Clinical results have been reported for all of these potential applications of compomers, and in general findings are positive.[22]

Clinical evidence has been accumulating over the years since the introduction of compomers that they are very clinically effective. They have been widely used in pediatric dentistry, particularly for Class I restorations. They have also been used as fissure sealants and for cementing orthodontic bands. Indults, they are generally used for Class V restorations. Typical clinical results over 2 to 3 years show high grades on all criteria, with only minor amounts of marginal discoloration and some loss of marginal integrity. Wear behavior is also reported to be good.[22]

Retention rate of compomers according to study by Sonia Gladys et al was 89% [23] while Abdalla and Alhadainy reported a retention rate of 100% [24] and Tyas M J reported 97%.[25] Glass ionomer have better retention because of their ability to bond with extra calcium ions available in cervical areas of sclerosed dentin, ability to tolerate presence of moisture and decreased dependence on dentin etching.

Fig 2: Compomer unit

Compomers vs Giomers

PRG-Composites (GIOMERS) employ the use of pre-reacted glass ionomer technology to form a stable phase of Glass Ionomer Cement in the restoration. Fluoroaluminosilicate glass in these materials is reacted with polyalkenoic acid in water prior to inclusion into the silica filled urethane resin.[26] These materials have fluoride recharge biocompatibility, smooth surface finish, excellent esthetics, and clinical stability, which has made them popular for restoration of root caries, noncarious cervical lesions, class V cavities, and deciduous tooth caries.[27]

Giomers employ the use of pre-reacted glass ionomer technology to form a stable phase of glass ionomer cement in the restoration. They incorporate fillers that are produced by the full or surface reaction of ion leachable glasses with polyalkenoic acid. These are expected to release fluorides and have fluoride recharge properties, whereas, in case of compomers, fluoride release occurs subsequent to water uptake, either as a result of dissolution of the glass filler particles or via the later generation of ionic reaction on the surface of the glass particles. Studies revealed a significant difference in the mean daily fluoride release from the giomer and compomer, where the fluoride release was higher in the giomer when compared to the compomer, for all treatment groups.[28]

Conclusion

Overall, the conclusion from numerous published clinical studies is that compomers perform well in a variety of uses in restorative dentistry. Their fluoride release, ease of handling, and good esthetics make them materials of choice for particular applications, especially in children's dentistry. So there really does seem to be a place for them in restorative dentistry.

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LASERS IN CLINICAL DENTISTRY: A REVIEW

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Abstract

Lasers were introduced into the field of dentistry as they are a precise and effective way to perform many dental procedures.Treatment with lasers provides a hope of overcoming the disadvantages of conventional dental procedures. As the applications For dental lasers expand, greater numbers of dentists will use the technology to provide patients with precision treatment that May minimize pain and recovery time. Every discipline of dentistry has been positively affected with the use of laser technology Including oral medicine, oral surgery, pediatric and operative dentistry, periodontics and implantology, prosthetic dentistry. The Ability of the lasers to perform less invasive procedures without any discomfort to the patients had made a tremendous impact On the delivery of dental care.

Key Words: Laser, clinical dentistry , review

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Introduction

The word LASER is an acronym for light amplification by stimulated emission of radiation. The principle of the laser was the first known in 1917 when physicist Albert Einstein described the theory of stimulated emission.[1] Lasers in dentistry are considered to be a new technology which is being used in clinical dentistry to overcome some of the drawbacks posed by the Conventional dental procedures. This technology was the first used for dental application in the 1960s but its use has increased rapidly in the last few decades.

Today, the lasers technology is used in the compact disc players, as a pointer for lecturer and above all in the medical And dental field. The use of laser technology and its advancements in the field of medicine and dentistry is playing a major role in patient care and well-being. [2]

Application of laser in Endodontics

The development of new delivery systems, including thin and flexible fibers as well as new endodontic tips, allows this technology to be applied to the following endodontic procedures:

- Pulp diagnosis
- Pulp capping and pulpotomy
- Cleaning and disinfecting the root canal system
- Obturation of the root canal system

- Endodontic re-treatment
- Apical surgery

Pulp diagnosis

Laser Doppler flowmetry

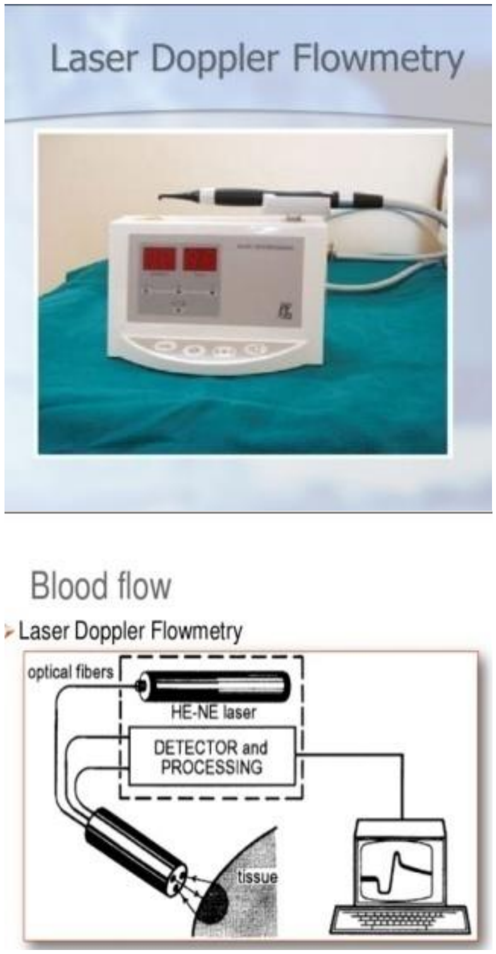

Fig 1: Laser Doppler Flowmetry

Laser Doppler flowmetry, can be used for diagnosis of blood flow in the dental pulp[2]..This technique uses helium-neon and diode lasers at a low power of 1 or 2 Mw. [3] The main advantage of this technique, in comparison with electric pulp testing or other vitality tests, is that it does not rely on the occurrence of a painful sensation to determine the vitality of a tooth. Moreover, teeth that have experienced recent trauma or are located in part of the jaw that may be affected following orthognathic surgery, can lose sensibility while intact blood supply and pulp vitality are maintained.[3]

Differential Diagnosis of Pulpitis By Laser Stimulation

Normal Pulp and Acute Pulpitis

When normal pulp is stimulated by the pulsed Nd: YAG laser at 2 W and 20 pulses per second (pps) at a distance of approximately 10 mm from the tooth surface, pain is produced within 20 to 30 seconds and disappears a couple of seconds after the laser stimulation is stopped. In the case of acute pulpitis, the pain is induced immediately after laser application and continues for more than 30 seconds after stopping the laser the laser stimulation

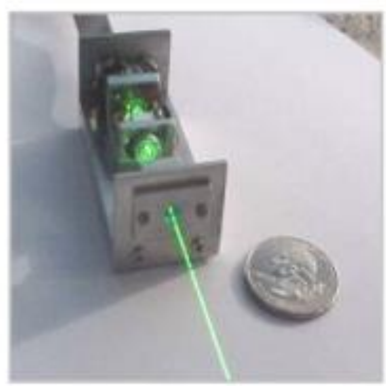

Fig 2: ND:YAG Laser

PULP CAPPING AND PULPOTOMY

Accessory Treatment by Laser for Indirect Pulp Capping

When using the pulsed Nd: YAG laser, it is necessary to combine the application of black ink o the tooth surface and air spray cooling to prevent dental pulp damage resulting from the laser energy provided by 2 W and 20 pps for less than 1 second on the area. A few articles have examined this clinical treatment. According to the author's experience, clinical cases treated using this method produced no postoperative pain.

Treatment by Laser for Direct Pulp Capping

When using the CO_2 laser for this treatment, laser irradiation of the exposed dental pulp must be performed to stop bleeding and sterilize the area around the exposure.

- Laser irradiation should be performed at 1 or 2 W after irrigating alternatively with 8% sodium hypochlorite and 3% hydrogen peroxide for more than 5 minutes. Calcium hydroxide paste must be used to dress the sealed with cement such as carboxyl ate cement. An 89% success rate is reported. The high success rate is thought to be due to control of hemorrhage, disinfection, sterilization, carbonization, and stimulation effects on dental lasers is found to be valid, the indication of this treatment may become more widespread in the future.

Preparation and Enlargement Of The Root Canal Orifice By Laser

Access cavity preparation had been performed by air turbine, and enlargement of the root canal orifice has been carried out using a Peeso (Melfer, Zurich, Switzerland) reamer or a gates Glidden drill or bur. The Er: YAG and Er, Cr: YSGG laser, which ablates enamel and dentin, have been developed and improved. As a result, these layers may soon replace the air turbine, Peeso reamer, and Gates Glidden drill as the primary method of treatment. Vital extirpation of infected root canals is one indication for these layers.

For Removing Pulp Remnants And Debris At The Apical Foramen

The pulsed Nd: YAG laser was used for removing pulp remnants and debris that are deposited at the apical foramen. A power of 2 W at 20 pps for 1 second is recommended.

Apicoectomy, Retrograde Endodontic Apical Cavity Preparation and Periapical Curettage by Laser: [4]

CO_2 and Nd: YAG lasers have been investigated for apicoectomy, retrograde endodontic apical cavity preparation and periapical curettage. A new laser device for tissue treatment was developed in the United States. This Er:Cr:YSGG laser is applicable for the treatment of soft and hard tissues
The use of a CO2 laser for root end cavity preparation appears to decrease apical leakage [5]

Root end cavities prepared by using the Erbium: Yttrium, Aluminum, Garnet (Er:YAG) laser show smaller micro leakage than those prepared using an ultrasonic instrument[6] (However, the diode laser irradiation does not improve the apical sealing of mineral trioxide aggregate retro fillings [7]

The Erbium, Chromium: Yttrium, Scandium, Gallium, Garnet (ErCr:YSGG) laser (Waterlase, Biolase Technology, San

Clemente, CA) can be used for the removal of the smear layer[8] biomechanical preparation, apicoectomies, root end preparation, hemostasis, and sterilization of the root end apex and surrounding tissues· This laser is an excellent option for cutting the root surface without causing carbonization or thermal damage after irradiation[8] within adequate parameters.

Sterilization or disinfection of infected root canals

The laser is an effective tool for killing microorganisms because of the laser energy and wavelength characteristics. Infected canals are an indication for this treatment but its difficult in extremely curved and narrow canals. Pulsed Nd: YAG, argon, semiconductor diode, CO , Er:YAG are 2 considered for this treatment.

Photoactivated disinfection

In Photoactivated disinfection (PAD), tolonium dye is applied to the infected area and light is transmitted into the root canals at the tip of a small flexible optical fiber that is attached to a disposable hand piece. Laser emits 100mW and does not generate sufficient heat to harm the adjacent tissues. [9]

The PAD technique has been shown to be effective for killing bacteria in complex biofilms, such as subgingival plaque, which are typically resistant to the action of antimicrobial agents.[10-12]

Root canal shaping

The laser beams can be delivered through an optical fibre that allows for better accessibility to the root canals. The technique requires widening the root canal by conventional methods before the laser probes can be placed in the canal. The fibres' diameter, used inside the canal space, range from 200-400 µm, equivalent to a No. 20-40 file.[13]

A technique considered optimal would be the irradiation from apical to coronal surface in a continuous, circling fashion and Levy [14] found that clean and regular root canal walls could be achieved using Nd: YAG laser irradiation.

Effect of Laser on Smear Layer and Debris

Goya, C., Yamazaki, R., Tomita, Y. et al (2000)[15] evaluated the removal of smear layer at the apical stop by pulsed Nd: YAG laser irradiation with or without black ink, and the degree of apical leakage after obturation in vitro. The laser was operated at 2 W and 20 pp for 2 s, and irradiation was performed twice with a 30-s interval.

The smear layer in the laser-treated groups almost melted or evaporated, and was removed significantly compared with the control group (unlashed teeth). Leakage was observed in 60% of samples in-group 1 (unlashed teeth) and in 20% of samples in-group 2 (lashed teeth). No leakage was observed in-group 3 (lashed teeth with Black ink).

These results suggest that pulsed Nd: YAG laser irradiation with black ink increases the removal of smear layer compared with that without black ink, and reduces apical leakage after obturation significantly.

Removal of Temporary Cavity Sealing Materials, Root Canal Sealing Materials, and Fractured Instruments in Root Canals

According to experimental results, it was easy to remove temporary cavity sealing materials made of zinc oxide, eugenol, or gutta-percha by pulsed Nd: YAG and Er: YAG lasers; and fractured reamers or files in slightly curved and wide root canals.

Root Canal Drying By Laser

Infrared lasers have been used for debridement and sterilization of both soft and hard tissues. A laboratory study by Walsh, L.T., Walsh, L.J. examined the feasibility of using pulsed infrared laser radiation to remove moisture from root canals (with an adjunctive sterilizing effect).

Laser application on root canal filling (gutta-percha or resin)

Gutta-percha is through to be melted by laser energy. Anic and Matsumoto attempted to investigate whether it is possible to perform the root canal filling using sectioned Gutta–Percha segments and a Nd: YAG laser[16,17]

This was shown to be possible by the vertical condensation method, but the technique requires too much time. At present, this technique is not practical. Although a method combining an argon laser and light-curable resin is in the literature, proper application of this method of this required of this method Requires further research.

Endodontic Retreatment

Yu et al. used the Nd:YAG laser at three output powers (1, 2, and 3 W) to remove gutta-percha filling (70% of samples) and broken files (55%) from the root canal space.Anjo et al. reported that the time required for removing root canal obturation materials using laser ablation was significantly shorter than using conventional techniques. It appeared that some orifices of the dentinal tubules were blocked with melted dentin after laser irradiation. The authors concluded that Nd: YAG laser irradiation is an effective tool for the removal of root canal obturation materials and may offer advantages over conventional methods.

Conclusion

The use of laser technology has been widely used in dentistry. When used efficaciously and ethically, lasers have been an essential tool in many dental treatments. However, lasers have got its own limitations. It has never been the “magic wand” in medicine and dentistry. The futures of laser dentistry are bright as further researches are going on. The emergence of lasers for various applications in dentistry may influence the treatment planning of patients.

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AWARDS AND ACHIEVEMENTS

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