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INDIAN DENTAL ASSOCIATION
KEALA STATE

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IDA PRESIDENT'S MESSAGE

Dear members of WDC,

" Women are supposed to be very calm generally: but women feel just as men feel; they need exercise for their faculties, and a field for their efforts as much as their brothers do; they suffer from too rigid a restraint, too absolute a stagnation, precisely as men would suffer; and it is narrow-minded in their more privileged fellow-creatures to say that they ought to confine themselves to making puddings and knitting stockings, to playing on the piano and embroidering bags. "
CHARLOTTE BRONTE, Jane Eyre

Let them explore their world, their passion and follow their dreams.

My pleasure to congratulate the Editorial Board who explored the nook and corner of creativity, put in their maximum efforts to bring out a scintillating E- Journal as the one. Illuminating women dentists with knowledge as well as motivation, in my opinion this e-Journal acts as a perfect guideline to every women dentist. My very best wishes to the WDC members and their innovative projects which I am sure they'll succeed in. Congratulating you once again.

Warm Regards

Dr. Antony Thomas,

President IDA Kerala State.

WDC CHAIR PERSON'S MESSAGE

Dear Members ,

"Somebody has to make some beginning somewhere" I am extremely glad to present this e-journal on behalf of all the women dentists of our country and am so proud to be a part of this great mission. The dream of this e-journal came true, only because of the hardwork and passion of Dr. Jyothi S.G., the editor of WDC. I appreciate
and congratulate her for the efforts and dedication she put to bring up this first e-journal of WDC, in the dental history of Kerala State.

We have many educated women in our country. In our country we have many qualified wives, who are heavily ill-treated and professionally blocked. Therefore, our attempt is to make our "educated" "wiser and empowered", which relatively is not an easier task. Each one of us are educated soldiers... Ours is just a humble attempt in this direction to empower all women dentist. To acheive this mission all women dentist should come forward and be active in WDC & IDA activities. We together can make this year a fruitful one. The new project of WDC for the year 2013 is "DONATE A SMILE", a free denture project to the poor and needy. I request each woman dentist to make at least one free denture and make this project a grand success.

The aim of WDC is to bring lady dentist to the limelight. Through this we would be able to enlighten and show our strength and abilities. I request all WDC members to participate in all activities and can make the up comming years a fruitful one

The epitome of beauty
So pious with her duty
Carries many prestigious role in life,
As a friend,a mother,and a wife
We must preserve her right,
As world without her is not bright
She endorses her affection
To everybody with perfection
In every sphere she is the best
Because she works with undying zest
Her plethora of success is never ending
And the glorious positioning in the society is now impending
SO BE PROUD TO BE A WOMEN.....

Dr. Thaj Rajmohan

Chairperson, WDC Kerala State.

IDA SECRETARY'S MESSAGE

Dear members,

I am very much happy to hear that women dental council is publishing a journal of their own.WDC is one of the strong women organization under Indian dental association especially Kerala chapter. The motive to form this organization mainly to uplift the women dental surgeon to do active role in association.I think a lot of changes happened among our lady members of their involvement in the association activities after the formation of WDC. The state office bearers of WDC are very much keen and interested to do the activities regularly for the last two years. We should appreciate the initiation taken by the president Dr. Thaj Rajmohan and secretary Dr. Mercy joji.But the branch level programmes of WDC is very poor. Except some branches, majority are not interested to follow the enthusiasms shown by the state leaders of WDC. So I request all the leaders of WDC to work more and make your members be active in your organization as well as in IDA.

I wish all the good luck for your projects and hope this journal will be useful for all the members to update their knowledge and to know the organization more.

Thanking you all

With warm regards
Dr. O. V. Sanal
Secretary, IDA Kerala State

WELL WISHES

The aim of human life is to transcend from animality to divinity through humanity by

Introspecting daily routine with simplicity and sharpness;

Jumping all trifles of life with devotion and determination;

Wholly utilizing commonsense to be surrendered and sacred;

Dedicating words and works with innate divinity;

Carefully planning and pleading with the Lord as such!

Wishing you all best of luck!

GURUJI

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EDITORIAL

"DERELICTION OF WOMEN'S DUTY TOWARDS THE NATION"

First of all, I would like to thank all the members of Indian Dental Association, Kerala State Branch, especially, Dr. Santosh Sreedhar, Dr. K.Nandakumar, Dr. Antony Thomas, Dr. O.V.Sanal, Dr. Raveendranath M., Dr. Shibu Rajagopal, Dr. Joji George, for encouraging us, and promoting a separate wing for Women Dentists i.e., Women's Dental Council (WDC), for the first time in Kerala State.

I would also like to thank all the members of WDC especially, Chairperson Dr.Thaj Rajmohan, Hon. Secretary Dr. Mercy Joji, Dr. Merlin, for their infinite inspiration, motivation, love and care for me to come-up with the first issue of this e-journal.

The main aim of the 1st issue of the "International Journal of Women's Dental Council (IJWDC)", e-journal, is to empower women dentists who are really talented and dynamic. This is not to create the 'gender divide', but to accomplish 'gender equity'. Certain relevant or irrelevant hesitations may discourage women dentists to come out with their flying colours, which will definitely affect the productivity of our profession, which, in turn, will automatically retard the development of our nation.

An employed woman can successfully lead a balanced professional as well as personal life, provided some moral support and professional satisfaction is established.

So, our IJWDC, e-journal, has strongly determined to provide both moral support and professional contentment by recognizing the hidden talents of women dentists.

"My dear ladies, ARISE.....AWAKE.....please come out of obcurantism from this chauvinism!!!!"

Dr.Jyothi S.G.

Editor, IJWDC

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ORIGINAL ARTICLES

GENERAL ARTICLES

CASE REPORT

Review Article

WOMEN IN DENTISTRY:

A HISTORICAL PERSPECTIVE

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ABSTRACT

Increase in women workforce represent the changing phase of dentistry all over the world. Last century saw the rise of women as competent and ambitious professionals ready to face the difficulties and challenges placed in front of her. In this article we go through the chronology of events marking the transformation of demure house restricted women of earlier centuries into self assured, hardworking, motivated modern day dental professional who strives to deliver the best care to the public

Introduction

The hands of females have been present in many fields of knowledge, yet history does not record it all. This is due to a cultural view that appreciates the work of men and favors them over women.[1]

Dentistry as any other health care profession requires hard working and motivated people who strive to deliver the best care to the public through managing their oral health, since the mouth is the first entrance of the body. Females comprise a significant percentage of dentists providing oral care for the general public.

It hardly seems possible that the wise woman of olden days did not relieve toothaches, just as she helped relieve other ills, but history of dentistry make no mention whatsoever of women. The modern picture is totally different; the future is more promising. In the years to come, dentistry will not, remain silent about women's many efforts and achievements in this branch of art of healing.[2]

Ortiz and Diaz de Kuri mention that for centuries in many nations women were already involved in related professions, including medical practice and this was recorded by ancient civilization in the form of paintings, engravings, ceramics and literature[3]. In ancient Greece, there were numerous cases of women practicing medicine and related activities. In the Roman Empire, women also practiced in different branches of medicine. A reference to this is the goddess, Maditrina. In the 14th

century, the Buddhist priestess Nakaoka Tei, known as Hotokehime, or the Lady of Buddha, constructed an entire set of teeth for herself from cherry wood which is now on display at the Tokyo museum in Japan. In medieval Europe, Saint Hildegard of Bengen (1099–1179) wrote a book on medicine (Liber Simplicis Medicinae) in which she mentioned dental treatment based on herbs and the need of draining abscessed teeth for the release of pus. In the 14th century, Rolando de Parma mentioned in a medical book about a woman placing a bandage around the jaw of a patient. 16th, 17th and 18th centuries saw dental treatment being done with wives, daughters and sisters acting as assistants to male physicians.[5]

Modern dentistry started with the first rotary instrument, described by Pierre Fauchard (1678–1761) in his book Le Chirugien Dentiste.[4] From this period onward, the involvement of women in dentistry occurred throughout Europe and North America.

In 18th century France, females worked as dental assistants. While other cultures were not accepting women in the practice of dentistry, the earlier development that took place in France allowed some women to practice dentistry during the 19th century[5]. Madame Ana, announced herself as a ‘‘dentist for women’’ and practiced in her clinic at Rue Rivoli in Paris[3]

The first women dentist in the United Kingdom (UK) graduated from the dental school in Edinburgh, Scotland in 1895[6]. Seventeen years later, women were granted the dental qualification from the Royal College of Surgeons of England[5].

In North America also the situation was no different. Women were considered to become wives and mothers, and were thought not to have the physical strength and other attributes required for dental duties[7]. In the 18th and early 19th century, none of the established US dental schools would accept women students, believing that they lacked the physical ability needed for the profession[1]. Dr. George T. Barker had published an editorial in the Dental Times in 1865[8] strongly objecting to the admission of women to the field of dentistry as it requires “mental and physical equipment of high order” and “the same reason holds good against females practicing dentistry that it does against feeble male.” In 1840, the first dental school in the world, the Baltimore College of Dental Surgery, was chartered by the state of Maryland. This was followed by the opening of a number of schools, although none would admit women. The first women to graduate from a dental school were persons who had to face enormous obstacles and many denials in order to obtain a better career and life, and to open the door for the other women students who followed.[1,9]

The first American woman dentist was Emeline Roberts. She was married to Dr Daniel Albion Jones. She became his assistant and studied at night the basic dental courses till she was able to become his partner and after his death managed his establishment. Lucy B. Hobbs Taylor, another pioneer, held the distinction of being

the first woman to be graduated from a dental college[2].

Gradually, dentistry became more popular among women students, especially Europeans, who, being barred from the schools in their own countries, came to America for an education. On the other hand, American dental schools were not anxious to admit women students. However, by 1880, women were generally accepted in many dental schools. To these pioneer women in dentistry the women dental students of today owe their privileges of education in their chosen profession .The American women's dental association was founded by Mary Stillwell Kuesel in 1892. At the Pennsylvania College of Dentistry in 1869, Henriette Hirschfield from Berlin, Germany was the first foreign student to complete dental school education in the United States and the second woman graduate after Hobbs[9].

INDIAN SCENARIO

Women in India have always been considered a step behind their male counterparts. The expansion of the number of women in dentistry has been one of the major dental workforce trends during the last quarter of the past century and will continue during the initial decades of this century. This is reflected in the greater number of female than male applicants to dental schools. Since 1999 there has been an increase in the female students, more so in 2000, and this trend is continuing today. Time has come to remove the notion that females lag behind males[10].

This was further proved by doing a brief headcount of the male and female students studying in three government dental colleges of Kerala. Girls to boys ratio was nearly 3:1, and unlike expected or thought by the early male professionals, no difference could be found in the work quality or commitment towards work among the male and female students. In fact female students were brimming with confidence, ambition and was very proud of their chosen profession.

There is a dearth of literature about women dentist's of India. Fatima Jinnah, the younger sister of Mohammed Ali Jinnah, founder of Pakistan is believed to be the pioneer female dentists of India. In 1919 she got admitted to the prestigious Calcutta University where she attended Dr. R. Ahmed dental college. After graduation, in 1923 she started a clinical practice of her own in Bombay and indulged in serving the people for about 6 years[12].

Dental practice in India mainly involves working in private or Government establishments. Women have been part of both these fields since a long time. There are many eminent female academicians in our country. A number of professors in the prestigious dental institutions are females, besides being a large knowledge pool and sought out members of the society they are also known for their sincerity towards work and commitment towards society. Private practice is also marked by a number of famous and sought after female doctors. Many women dentists have broadened their horizons by acquiring foreign degrees and foreign training.

Today, like many other western countries, women in India too are the part of

various professional organizations related to dentistry, but whether there is equality in the representation, is something to think about, as there has still been no female president for any of these professional organizations. Today there is a wave of women dentists surging through dentistry[11].

The world is changing at enormous speed. Numerous challenges lie ahead of women workforce, to keep pace with the fast changing society, so that they are not left behind in service and are able to cope with the desires of the society.

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Review Article

WOMEN, HORMONES AND ORAL HEALTH

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Abstract:

Even though men and women share the same basic oral anatomy, there are certain conditions in the mouth that are simply more prevalent among women. Fluctuation of estrogen levels that occur in the female body through puberty, menstruation, pregnancy, menopause and even use of contraceptives are all associated with triggering complex biochemical reactions that allow the bacteria associated with gingival and periodontal diseases to thrive. Good oral health and control of oral diseases protects a woman's health and quality of life during various stages of her life. This article focuses on the effect of sex hormones on the oral health, that helps to update practitioner's knowledge about the impact of these hormones on women's oral health.

Keywords: Estrogen, menopause, oralhealth, pregnancy.

Introduction

Female hormones are generally associated with the reproduction and pregnancy. Estrogen is the female reproductive hormone responsible for regulating the menstrual cycle where as progesterone is another hormone that is associated with pregnancy. Women may be more susceptible to oral health problems because of the unique hormonal changes they experience. The keratinized and non keratinized mucosae of the oral cavity are normally under trophic influence of various hormones. More than progesterone or testosterone, estrogen fluctuations are most associated with the biochemical changes in the mouth that promote bacterial growth.[1]

When are women more at risk for oral health problems?

Throughout the reproductive life cycle of women, fluctuating level of sex hormones have direct and indirect effects on oral health. There are 5 situations in a woman's life during which hormone fluctuations make them more susceptible to oral health problems;

1. Puberty
2. The monthly menstrual cycle.
3. The use of contraceptive medications.
4. Menopause and post menopause
5. Pregnancy.

Mechanism of action of sex steroid hormones on gingiva of women:

There are 2 theories for the action of the hormones;

(a) Change of the effectiveness of the epithelial barrier to bacterial insult.

(b) Effect on collagen maintenance and repair.[2]

The gingival tissues respond to increased levels of estrogen and progesterone by undergoing vasodilatation and increased permeability. Consequently there is an increased migration of fluid and WBC out of blood vessels. Also associated with increased progesterone levels are existing levels of microbial populations. The levels of Gram negative anaerobic bacteria such as Prevotella intermedia, increased as a result of the high concentration of hormones available as a nutrient for growth[3,4]. In gingival and other non periodontal tissues more evidence has accumulated for progesterone affecting the local vasculature than for estrogen. Human PDL cells possessed immunoreactivity for estrogen receptors where as progesterone doesn't have a direct on PDL cell function.[5]

Puberty

The surge in production of the female hormones estrogen and progesterone that occurs in puberty can increase the blood flow to the gingiva causing the gingiva to become red, tender and edematous and more likely to bleed during brushing and flossing. As a young girl approaches her first menstruation, estrogen levels rise in preparation for her first ovulation.

The monthly menstrual cycle

Due to the hormonal changes particularly the increase in progesterone that occur during the menstrual cycle; some women experience oral changes that can include bright red edematous gingivae, swollen salivary glands, aphthous ulcers, herpetic labialis, burning sensation in the oral cavity, mobility of teeth, candida albicans and prolonged hemorrhage following oral surgical procedures.[6] Menstruation gingivitis usually occurs a day or two before the start of the period and clears up shortly after the period has started.

Gingival changes in menstruation are attributed to hormonal imbalances and in some instances accompanied a history of ovarian dysfunction. Gingival exudates increases during menstrual cycle reaching a peak at ovulation and then decline during secretory phase.[7]According to Machtei gingival inflammation was lower during menstruation than during ovulationand premenstruation which is attributed to serum estriadol that peaks up and drops during ovulation and premenstruation. Gingivitis intermenstrualis was observed by Muhleman as bright red hemorrhagic lesions of the interproximal papillae prior to menstruation.

Relationship of oral aphthae with menstruation have been reported by various authors [8, 9.] Some studies have demonstrated clear relationship between aphthae and menstrual cycle with ulceration in the luteal phase due to changing levels of progesterone. [10] Dayal J proposed the correlation between psychological stress and premenstrual period with occurrence of aphthae. [11]

The use of contraceptive medications

Oral contraceptive pills act by elevating hormonal levels to simulate pregnancy and prevent ovulation. Hence it is

expected that the same gingival changes seen during pregnancy will also be seen in women taking oral contraceptives. The most profound gingival changes are seen in the first few months after starting the contraceptive. Once the pill is discontinued, the gingival condition will reverse. The newer formulations contain lower concentration of hormones.[12]

Menopause and post menopause

Numerous oral changes can occur as a consequence of advanced age, the medications taken to combat diseases and hormonal changes due to menopause. These oral changes include altered taste, pain and burning sensations in the mouth, xerostomia, increased sensitivity to hot and cold foods and loss of bone density due to osteoporosis.[13,14] During menopause there is a decrease in the levels of progesterone and estrogen circulating in the bloodstream. Those women who take estrogen supplements will have less chance of gingival inflammation as these supplements bring hormonal levels back to normal.

Estrogen plays an important role in bone growth and maturation as well as in the regulation of bone turn over in adult bone. Exactly how estrogen deficiency causes bone loss still remains largely unknown, but it is known that the bone loss associated with osteoporosis is not limited to the larger skeletal structures; it can also affect the jaw and consequently the teeth.[15,16.]Osteoporosis results from increased resorption of bone, decrease formation of bone, decrease estrogen levels, decrease calcium levels or age related changes. Recent studies confirm previous studies finding that the systemic bone loss in osteoporosis is associated with loss of bone surrounding the teeth.[17]

PREGNANCY

Pregnancy results in physiologic changes in almost all organ systems in the body mediated mainly by female sex hormones. An increase in the secretion of estrogen by 10- fold and progesterone by 30- fold is important for the normal progression of pregnancy. Oral changes seen in pregnancy include gingivitis,periodontitis, pregnancy tumor, salivary changes ,mobility of teeth and dental caries.[18,19] .Most common oral disease in pregnancy is gingivitis with a prevalence of 60-75%.During pregnancy gingivitis is aggravated by fluctuations in estrogen and progesterone levels in combination with changes in oral flora and a decreased immune response.[20]

Elevated circulating estrogen, which causes increased capillary permeability, predisposes pregnant women to gingivitis and gingival hyperplasia. Toxins produced by the bacteria stimulate a chronic inflammatory response and the periodontium is destroyed, creating pockets that are infected. The teeth become mobile. This process can induce recurrent bacteremia resulting in production of cytokines, prostaglandins, and interleukins(PGE_2,IL-6,IL-8).The increased levels of these markers have been found in the amniotic fluid of females with periodontitis and preterm birth.[21]

Teeth can loosen during pregnancy, even in the absence of gingival disease,

because of increased levels of progesterone and estrogen affecting the periododntium.[22] The main salivary changes in pregnancy involve its flow, composition, pH and hormonal levels. The change in composition of saliva includes a decrease in sodium and pH, increase in potassium, protein and estrogen levels. Salivary estrogen levels are higher in the women destined to have preterm babies.[23,24] Salivary estrogen also increases the proliferation and desquamation of the oral mucosa and an increase in sub gingival crevicular fluid levels. The desquamation cells provide a suitable environment for bacterial growth by providing nutrition disposing the pregnant women to dental caries.[25]A positive correlation between periodontal disease and low birth weight has been reported.[26,27]

Pregnancy tumor is caused by increased progesterone in combination with local irritants and bacteria. Lesions are erythematous,smooth and lobulated located on the gingiva.They are most common after the first trimester, grow rapidly and typically recede after delivery.[28] There is an increase in facial pigmentation called melasma or mask of pregnancy appearing as bilateral brown patches in the midface.This is believed to be related to the increase in serum estrogen and progesterone.[29]

Oral Health Guidelines: [30]

Good oral hygiene at home is the first best any woman can take to help keep oral bacteria under control, especially during times of hormonal transition.

Puberty - Local preventive measures such as scaling, improving oral hygiene.

Menstruation – Dental visit; use the softest tooth brush and slow down flossing

so that gingival trauma is avoided.

Pregnancy - Dental visit; scaling improving oral hygiene and frequent recall checkups.

Expectant mothers can be educated on the importance of infant oral health that can promote health for the next generation.

Brushing twice daily with fluoridate tooth paste and flossing daily.

Taking prenatal vitamins, including folic acid to decrease the risk of birth defects such as foods high in protein,Ca,P,vit A,C,D.

Limiting food containing fermentable carbohydrates.

Limiting carbonated drinks,juice ,soda etc. To decrease erosion of tooth surfaces due to and vomiting; eat small amounts of nutritious snacks in protein such as cheese; rinsing with a teaspoon of baking soda in a cup of water after vomiting; avoid toothbrushing directly after vomiting.

Menopause – Dental check up before starting hormone replacement therapy /oral bisphosphonates.

Good oral hygiene at home.

Diet – Healthier,low sugar,low refined,carbohydrate diet.

Antioxidants – Supplements like coQ 10, Green tea extract, B, C, D vitamins may be helpful in controlling episodes of gingivitis associated with menstrual cycle and other hormonal transitions.

Conclusion

To be effective, oral health promotion must first seek to educate women and their health care providers about the importance of oral health, ways to prevent oral diseases from occurring and referral for dental services when disease is present. As dentists we need to improve oral health awareness and access to preventive oral health care among women of all ages.

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Review Article

PHOTODYNAMIC THERAPY IN PERIODONTICS: A REVIEW

Simple Varghese MDS -In Laser Dentistry.

ABSTRACT

Due to penetration of pathogenic bacteria in to the periodontal tissue in moderate to severe periodontitis, the mechanical methods are not sufficient in these cases. Therefore administration of local/ systemic antibiotics is recommended following mechanical root debridement. However side effects of antibiotics such as microbial resistance and patient allergy led to alternative methods. One of the suggested method is the antimicrobial photodynamic therapy (aPDT). It is a local non invasive treatment modality without side effects caused by antibiotics. The following paper will outline PDT use in periodontics and provide a review of literature.

Introduction

Periodontitis is an inflammatory disease which include gingival inflammation, loss of attachment apparatus, pocket formation and alveolar bone loss.

. Various pathogens including Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis are responsible for the host epithelial cells invasion and the resulting invasion of deeper tissues.[21,22]

In the treatment of periodontally involved teeth, current concepts are based on mechanical scaling and root planning to remove bacterial deposits, calculus, and cementum contaminated by bacteria and endotoxins. Removal of plaque biofilm and mineralized deposits from the tooth surface are the fundamental aspects of periodontal therapy and which can be impaired in sites with difficult access. Using antimicrobial agents to treat periodontitis without disruption of the biofilm and development ultimately results in treatment failures.

Photodynamic therapy (PDT) is a mechanism which destroys target cells by reactive orygen species produced by photosensitizing compounds and light of an appropriate wavelength. Advantage of PDT includes rapid bacterial elimination minimal chance of resistance development and safety of adjacent host tissue and normal microflora. Applications of PDT in dentistry are growing rapidly.

Historical aspects

Therapeutic use of ultraviolet light begins in 1900 when Raab reported that combination of achridine orange and ultraviolet light could destroy living organisms. In 1950s Ronchese attempted to activate endogenous fluorescent molecules in tumour tissue to deleniate its boundarirs accurately. In the 1970s Dougherty discovered that fluorescein diacetate could photodynamically destroy TA-3 cells in vitro. Dougherty then began treating tumor bearing animals with fluorescein and found that it could work as a photosensitizer. PDT was approved by the food and drug

administration in 1999 to treat precancerous skin lesions of the face or scalp5

PDT has emerged in recent years as non invasive therapeutic option.[1,2]

Mechanism of action

Photodynamic therapy comprises of three components, light, photosensitizer and oxygen. A photo sensitizer is a chemical compound that readily under goes photo excitation and then transfer its energy to other molecules. Usually the photosensitizer is excited from a ground state (quantam state with zero spin angular momentum) to an excited singlet state. It then undergoes inter system crossing to an excited triplet state[23].

There are two mechanisms by photosensitizer can react with biomolecules, type I & II. Type –I reaction involves between the excited state of the photosensitizer and an organie substrate molecule of the cells, producing free radicals. These free radicals react rapidly with oxygen, resulting in the production of highly reactive oxygen species, superoxide, hydroxyl radicals and hydrogen peroxide) which are harmful to cell membrane integrity, causing irreparable biological damage[1,6].

In type II reaction the triplet state photosensitizer reacts with oxygen to produce an electronically excited and highly reactive oxygen species, known as singlet oxygen which can react with a large number of biological substrates including oxidative damage on the cell membrane and cell wall. Singlet oxygen has a short life time and a very short radius of action.

Hence the reaction takes place within a limited space, leading to a localized response, thus making it ideal for application to localized sites without affecting distant cells or organs. Thus the type –II reaction is considered as the major pathway in microbial cell damage. Ultimately these reactions will kill the cells through apoptosis or necrosis .

Light Source

PDT requires a sources of light to activate the photosensitizer by exposure to low power visible light at a specific wavelength. Most photosensitizers are activated by red light between 630nm and 700nm, corresponding to a light penetration depth from 0.5 cm to 1.5 cm[7,8] this limits the depth of necrosis. The total light dose, dose rates, and the depth of destruction vary with each tissue treated and photosensitizer used.

Table 1

Photosensitizers Examples

1. Phenothiazine dyes
2. Phthalocyanines
3. Chlorophil platform porphyrins
4. Xanthenes
5. Monoterpene

Methylene blue, toluidine blue O (tolonium chloride) Aluminum disulphonates pthalocyanine, cationic Zn pathalocyanine, Naphthalocyanine. Clorins-Purpurius-Bacteriochlorius HPD, photofrin and ALA (5-aminolevulinic acid) Erythrocin Azulune. Table2

Generations Photosensitizers

1. First generation
2. Second generation
3. Third generation

Application of photodynamic therapy in Periodontics.

Photofrin, hematoporphyrin ALA, Benzoporphyrin derivative. Biologic

Conjugates (antibody Congugate, liposome Congugate).

Antimicrobial PDT can be considered as an adjunctive to conventional mechanical therapy. The liquid photosensitizer placed directely in the periodontal pocket can easily access the whole root surface before activation by the laser light through an optical fiber placed directly in the periontal pocket.

As a result of the technical simplicity and effective bacterial killing the application of PDT in the treatment of periodontal diseases has been studied extensively. Antimicrobial PDT not only kills the bacteria but also detoxify the edotoxins such as lipopoly saccharide. Then lipopoly saccharides treated by PDT do not stimulate the production of pro-inflammatory cytokines by mononucelear cells. Thus PDT inactivates endotoxins by decreasing their biological activity[13].

Bacteria associated with periodontal disease can be killed through photosensitization with toluidine blue by irradiating with helium neon soft laser. Data from an in vitro study indicated that PDT could kill bacteria organized in a biofilm[14].

As an adjunct to scaling and root planning

Wide ranges of persistant human infections are due to microbial biofilms. Microorganisms grow in biofilms stuck to a solid surface where they multiply and form microcolonies embedded in extracellular polymeric matrix, which includes water and nutrient channels periodontal diseases results from accumulation of subgingival bacterial biofilms on tooth surfaces. There is reduced susceptibility of these biofilms to antimicrobial agents. Mechanical removal of periodontal biofilm is currently the most frequently used method of periondontal disease treatment. Systemically administrated antibiotics are used for the treatment of periodontitis but certain biofilm species exhibit antibiotic resistance mechanisms, such as quorum sensing.Recently non invasive PDT has been introduced which uses low level laser. Unlike high level lasers PDT can selectively target the bacteria without potentially damaging the host tissues.

A randomized controlled clinical study compared the effects of PDT alone without sub gingival SRP to with sub gingival SRP in subject with aggressive periodontitis. At three months following the therapy both treatments showed comparable out comes in terms of reduction bleeding on probing and probing depth (PD), gains in clinical attachment level (CAL), thus suggesting a potential clinical benefits of PDT.

Bhatia et al demonstrated that the optimal concentration of toludine blue o to kill P.gingivalis was 12.5mg/ml with helium – neon laser irradiadtions. This was caused by the disruption of outer membrane[15,16] proteins of these bacteria.[16,17]

. Chan and Lai showed that the presence of methylene blue at the wavelength of 632.8nm (helium neon laser) and 665 and 830nm (diode laser) has a high bactericidal effect on periodontal pathogens.[18]

Several studies have demomstrated bactericidal and detoxification effects an high level lasers on contaminated dental implant surfaces. High level lasers have

been used successfully in the surgical management of periimplantitis. Hass et al examined the efficacy of PDT in killing bacteria associated with periimplantitis which adhered to titanium plates with different surface characteristics.SEM analysis showed that aPDT led to bacterial cell destruction with out damaging the titanium surface. Shilbi et al reported that PDT could reduce the bacterial count P.intermedia, P.nigrescens, Fusobacterium nucleatum,in ligature induced peri-implantitis dogs19

.Various controlled clinical studies shows it obvious that in patients with chronic periodontitis, aggressive periodontitis and periimplantitis, the adjunctive use of PDT to scaling and root planning may result in greater CAL, reduction in BOP, and PPD.

Advantages of PDT

1. Reducing treatment time.
2. No need for anesthesia.
3. Facilitates access into deep limited access sites.
4. PDT can disrupt plaque biofilm.
5. Reduced need for surgery/direct flap approach,patient comfort enhanced.
6. Reduced risk of bacteremia.
7. Useful in treatment of mucosal pathologies.
8. GBR success enhanced following PDT.

Disadvantages of PDT

1. Most of the dyes adhere strongly to the soft tissue surface of the pocket, and retention of dyes in the pocket, even for a short period of time, may affect periodontal tissue attachment during wound healing.
2. Photosensitizers can compromise patient esthetics by producing temporary pigmentation of the periodontal tissues.Excess dye should be removed with water spray.Use of dyes ina paste base is better rather than liquid base.
3. Extended duration of exposure at the same spot should be avoided to prevent thermal accumulation or injury to deeper tissue,such as bone or dental pulp.23

Conclusion

Antimicrobial PDT seems to be unique and interesting therapeutic approach toward the treatment of periodontitis and periimplantitis. Diode laser wavelength exhibits a deep tissue penetration basically do not interact with the periodontal tissues with in the pocket or tooth crown. Therefore PDT as a low level therapy using a diode laser with a short irradiation time is considered not to produce any thermal changes. with in the gingival tissues and root surfaces, or destruction of the intact attachment apparatus, at the base of pockets. Extended period of irradiation at the same spot must be avoided to prevent any thermal accumulation or injury to the deeper tissues. For the safer use of laser in the clinical environment, the practitioner should have precise knowledge of the characteristics and effects of the laser system and its performance during application.

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Review Article

CBCT (CONE-BEAM COMPUTED TOMOGRAPHY) – AN AUXILLARY RESOURCE IN THE FIELD OF DENTISTRY

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Abstract:

CBCT is an emerging CT technology which has its potential applications for imaging of high contrast structures in the head and neck including maxillofacial region. CBCT technique used along with the software programs for the reconstruction of data has taken the concepts of imaging to an entirely different level.

INTRODUCTION

The keystone in delivering effectual treatment requires precise imaging modalities. Although the conception of CT by Godfrey Hounsfield in 1970 proved as a major advancement in the field of imaging[1]. It had characteristic limitations of all 2D projections such as prolonged examination time, distortion, magnification, super imposition and misrepresentation of structures which ultimately lead to the innovation of CBCT. Initial application of CBCT was limited to CT angiography and in 1982 it was adapted for clinical use at Mayo Clinic Biodynamic Research Laboratory[2]. The dental use of CBCT was initiated in late 1990's by Mozzo et al[3] and Assai et al[4] and it was only in 2001 that the technology had become commercially available.

PRINCIPLE

Based on X-ray beam geometry, the X-ray in CBCT is cone shaped whereas in conventional CT it is fan shaped. CBCT is the low dose scanning system with a radiation of 30 to 80 micro sieverts[2] and consists of a fixed Xray source and detector mounted in opposite sides of the revolving gantry which rotate in union. CBCT scans the field of interest in a single 360 degree rotation while capturing multiple images which produces a series of 2D images. The images are then fed into systems with software programes incorporated with sophisticated algorithm which then generates a 3D volumetric data and provides reconstructed images in all three orthogonal

planes; coronal, saggital, oblique and curved image planes; the process which is referred to as multi planar reformation[5].

USES OF CBCT IN DEFERENT BRANCHES OF DENTISTRY

1. PERIODONTAL APPLICATIONS
   i. Measurement of quality, architecture, level of bone and osseous defects[6].
   ii. Assessment and evaluation of periodontal therapies and bone grafts used.

2. ENDODONTIC APPLICATIONS

i. Localisation and characterisation of root canals[7].

ii. Elucidation of internal and external resorption.

iii. Treatment of periapical lesions.
iv. Treatment planning of periapical surgeries[7].
v. Assessing endodontic failures such as extended RCT material, localising broken endodontic instrument[8].
vi. Differentiating solid from fluid filled lesions, i.e. periapical granuloma from cyst[9].

3. ORTHODONTIC APPLICATIONS

i. Allows better viewing of resorption of teeth in the facial and lingual aspects[10].

ii. Aids in successful placement and treatment planning of where temporary anchorage devices (TAD) should be placed[11].

iii. To evaluate the symmetry of face in orthodontic patients (cephalometrics).

iv.To assess relevant structures prior to orthodontic treatment such as the presence and position of impacted teeth[2].

v. To assess unilateral nature of posterior crossbites[12].

vi.To permit 3D reconstruction of bones or fabrication of biomodels of face and jaws[2].

4. ORAL SURGERY- APPLICATIONS

i. To determine the position and angulation of impacted or supernumerary teeth[2].

ii.To determine position of roots and degree of displacement of root fractures[12].

iii.To provide exact anatomic relationships of condyles, mandibular rami and body in detecting condylar erosions and degenerative changes of TMJ[13].

iv.To locate the course of mandibular canal, mental foramina are important for any surgical procedures involving the mandible[14].

v. To quantify volume of airway in sleep apnea.

vi.To determine the morphology of sites for placing implants or osteotomes[14].

vii. Treatment planning for sinus lifts, ridge augmentation[2], sialolithiasis, osteomyelitis[14]

and in cleft lip and palate patients[12].

5. PROSTHODONTIC APPLICATIONS

i. Extent of alveolar ridge resorption and architecture for the placement of dentures.

ii. Evaluation of bone level, quality and quantity of bone for the placement of implants[14].

6. APLICATIONS IN ORAL PATHOLOGY , ORAL MEDICINE AND RADIOLOGY

i. Aids in diagnosis, treatment planning and follow up of dental developmental anomalies[15].

ii. Role in radiotherapy as intensity modulated radiation therapy (IMRT) delivers highly conformal radiation to the targets while minimizing doses to normal tissues and vital organs[16].

iii. Shows high sensitivity and specificity of salivary calculus diagnosis[17].

iv. Early detection and assessment of lesions involving bone[18].

ADVANTAGES

1. CBCT versus DENTAL X-RAY

i. CBCT overcomes the problems of panoramic radiographs by minimizing the magnification and distortion.[19]

ii. Panoramic radiographs produces images of only one dimension and the structures between Xray tube and detector are superimposed on one another and hence difficult to separate and identify the side.

2. CBCT versus CT

i. CBCT requires lesser chair time depending in the area of interest and desired quality of image than tomography.

ii. Equipment is lighter and smaller and costs 3-5 times lesser than traditional CT , have better spatial resolution , does not require special electrical requirements hence is easy to operate and maintain and very little technician training is required .

iii. Room need not be cooled and no floor strengthening produces are required.

iv. In conventional CT radiation dose is about 100-300 micro sieverts for maxilla and 200-500 micro sieverts for mandible whereas in CBCT the radiation dose is 34-1000 micro sieverts for both the jaws.

v. Most important advantage of CBCT is that it offers 3D visualization which reconstruct projection data to provide images in three orthogonal planes in a single 360 degree rotation and hence has rapid scan time of about 10-40 seconds range.

DISADVANTAGES [20]

i. Xray beam artifacts are more pronounced as CBCT beam is heterochromatic and has lower mean Kvp energy where compared to CT which can result in streaking, shading , rings and distortion. Streaking and shading artifacts are due to high areas of attenuation such as metallic restorations.

ii. Cone beam projection geometry, detector sensitivity and contrast resolution creates an inherent noise.

iii. Scatter to primary ratio are as long as 0.4-2.0 in CBCT when compared to 0.01-0.15 in CT.

iv. CBCT provides poor soft tissue contrast due to noise and scattered radiation.

iv. In vitro studies involve patient motion and motion can lead to CBCT image degradation.

SUMMARY

CBCT imaging was developed as an alternative to conventional CT and has overcome almost all limitation posed by conventional CT . It has become a very reliable imaging procedure based on series of preliminary clinical studies and case reports when compared with other methods of tomographic imaging. Its promise and application in dentistry have already been determined by its easier performance in dental office, low cost, lesser time together with low radiation dose . Hence CBCT is highly useful in various branches of dentistry and can serve as an indispensable part of dental imaging armamentarium.

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Review Article

Implant Biomaterials: A Review of Literature

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Abstract

Implant materials are foreign materials that are brought into contact with a biological system. Numerous materials and systems are available that can be used for implantation. This article reviews the various implant biomaterials available at present along with the materials that are being experimented for future use.

INTRODUCTION

Implant dentistry is becoming less of a luxury and more of a viable treatment option for replacement of lost teeth. New heights are being scaled regularly with the advent of improved techniques, superior materials and a comprehensive understanding of bone dynamics. The evolution of any implant modality is a multipart story in which significant roles have been played by biomaterials. Metallic and nonmetallic implantable materials have been studied in the field of orthopedics since the turn of the twentieth century.

In the 1960s, emphasis was placed on making the biomaterials more inert and chemically stable within biologic environments. The high-purity ceramics of aluminum oxide, carbon, and carbon-silicon compounds and extra-low-interstitial (ELI) grade alloys are classic examples of these trends. In the 1970s, biocompatibility was defined in terms of minimal harm to the host or to the biomaterial. Importance of a stable interaction then moved into central focus for both the research and clinical communities. In the 1980s, the focus transferred to bioactive substrates intended to positively influence tissue responses. In the 1990s, emphasis has been on chemically and mechanically anisotropic substrates combined with growth (mitogenic) and inductive (morphogenic) substances.

Today, many biomaterials are being constituted, fabricated, and surface-modified to directly influence short- and long-term tissue responses. Bioactive coatings on most classes of biomaterials have continued to evolve from human clinical trials to acceptable modalities of surface preparation, and research focus has shifted to

combinations of active synthetic and biologic implant materials.

CLASSIFICATION

The various implant biomaterials can be classified as [1, 2, 3]

a) Metals and alloys:

1. Commercially Pure Titanium

2. Titanium – 6 Aluminum – 4 Vanadium

3. Titanium – 5 Aluminum – 2.5 Iron

4. Cobalt - Chromium - Molybdenum alloys

5. Iron – Chromium - Nickel alloys (316 L stainless steels)

6. Other metals and alloys

-Tantalum

-Niobium

b) Ceramics

(i) Oxide Ceramics
(1) Aluminum Oxide:

- Monocrystalline (sapphire)

- Polycrystalline (alumina)

(2) Titanium Oxide

(3) Zirconium Oxide

(ii) Calcium – phosphate ceramics
(1) Hydroxylapatite

(2) Tricalcium phosphate

(3) Glass Ceramics

c) Carbons

1. Carbon

2. Vitreous carbon implants

3. Low – temperature isotropic pyrolytic carbon implants

4.Carbon – Silicon compounds

d) Polymers (plastics)

1. Polymethyl methacrylate (PMMA)

2. Polytetrafluoroethylene (PTFE)

3. Polyethylene (PE)

4. Polysulfone

5. Silicone rubber

e) Compound Materials

1. Titanium +HA

+TCP

+Al_2O_3

2. Al_2O_3 + HA

f) Coated surfaces

1. Plasma – sprayed titanium surfaces

2. Incorporation of bone morphogenetic proteins

3. Calcium phosphate ceramic coating materials

- Hydroxylapatite (HA) $Ca_{10}(PO_4)_6(OH)_2$

- Tricalcium phosphate (α-TCP, β-TCP) $Ca_3(PO_4)_2$, with some MgO
- Fluorapatite (FA) $Ca_{10}(PO_4)_6F_2$
- Tetracalcium phosphate (TTCP) $Ca_4P_2O_9$
- Calcium pyrophosphate $Ca_2P_2O_7$
- Brushite $CaHPO_4$, $CaHPO_4.2H_2O$
- Bioglass SiO_2-CaO-Na_2O-P_2O_5-MgO, etc

METALS AND ALLOYS

The use of metals for implants dates back to ancient times. Titanium is the most commonly used metal.

TITANIUM

Titanium was first isolated, and then named by M.H Klaproth in 1795. Titanium has become the metal of choice due to its excellent biocompatibility, corrosion resistance, and desirable physical and mechanical properties [4].

Crystallographic forms of titanium and its alloys

Titanium alloys of interest to dentistry exist in three forms: alpha, beta, and alpha-beta. The alloys most commonly used are of the alpha-beta variety. These types originate when pure titanium is heated, mixed with elements such as aluminum and vanadium (alpha and beta -phase condition stabilizers respectively) [5] in certain concentrations, and then cooled.

ASTM International (American Society for Testing and Materials) recognizes four grades of commercially pure titanium (grades I to IV) based on the incorporation of small amounts of oxygen, nitrogen, hydrogen, iron, and carbon during purification procedures and three titanium alloys [Ti-6Al-4V, Ti-6Al-4V Extra Low Interstitial (low components) and Ti-Al-Nb] [4, 6].

Table- 1 shows physical properties of Cp-Ti and Ti alloys.

Commercially Pure Titanium	
Grade1	Excellent corrosion resistance, maximum formability, limited strength.
Grade2	Very good formability, good strength.
Grade3	Good formability, high strength.
Grade4	Highest strength of commercially pure grades, limited ductility.

Ti 6A1 4V	Most widely used titanium alloy, excellent fatigue strength.

CERAMICS

Ceramics are inorganic, nonmetallic, nonpolymeric materials manufactured by compacting and sintering at elevated temperatures (>800°C). Ceramics have been used in bulk forms and more recently as coatings on metals and alloys [7,8].

Oxide ceramics

The oxide ceramics are bioinactive, wherein good supportive bone with lamellar orientation can normally be expected to grow closely onto the ceramic surface (contact osteogenesis). High ceramics from aluminum, titanium, and zirconium oxides have been used for root form, endosteal plate form, and pin-type dental implants.

Calcium – Phosphate Ceramics

Calcium phosphate ceramics are bioactive substances which release calcium and phosphate ions into the tissue milieu, resulting in a physicochemical bond due to incorporation of freed ions in the osseous metabolism [7] (bond osteogenesis; Osborn et al. 1980, Gross et al. 1985).

From the family of calcium phosphate ceramics, to date only the tricalcium phosphate (TCP) and hydroxylapatite ceramics have been of clinical significance [7] (Katthagen 1986, Kasperk and Evers 1988, Bauer et al. 1987, Tetsch et al. 1987). [8] These two compositions (HA and TCP) have been used most extensively as particulates for bone augmentation and replacement, carriers for organic products, and coatings for endosteal and subperiosteal implants [8,9].

POLYMERS AND COMPOSITES

The use of synthetic polymers and composites of polymers continues to expand for biomaterial applications.

In implant dentistry, polymers are being chosen mainly for manufacturing of parts of the superstructures or to add shock-absorbing qualities to load bearing metallic implants. Here the inherent, relatively poor time-dependent mechanical properties of most polymeric dental materials have, however, been a limitation resulting in periodic replacement due to wear [3, 10].

Some polymeric materials appear to have the potential to act as carriers for growth factors and thus may be used in conjunction with dental implants in some form [10] (Radder et al., 1995). Recent tests of the suitability of specific polymer surface coatings of titanium implants have demonstrated bone-bonding characteristics similar to those of those of hydroxylapatite, but they have also shown reduced mechanical stresses at the bone-implant interface as a result of the flexibility of the polymer coating. In this context, it is interesting to note that the results of cell culture studies indicate that the bioadhesive

strength of fibroblasts to gas-plasma-treated polystyrene surfaces is found to be related to the type of oxygen bonding present

there [3] (i.e., C-O, C=O, O-C=O).

Fiber-reinforced polymers offer advantages in that they can be designed to match tissue properties, can be anisotropic with respect to mechanical characteristics, can be coated for attachment to tissues, and can be fabricated at relatively low cost.

Expanded future applications for dental implant systems, beyond inserts for damping force transfers such as those used in the IMZ (Interpore Inc.) and Flexiroot (Interdent Corp.) systems are anticipated as interest continues in combination of synthetic and biologic composites.

SURFACE COATINGS / SURFACE TREATMENTS

Surface modification can be critical for an implant, because the direct bone-to-implant contact is never established between the implant metal and the host tissue, but rather between the biomolecules in the tissue and the surface oxide of the implant (Kasemo Lausmaa 1985)[11].

The influence of surface quality on implant integration has been previously investigated to some extent (Steinemann et al. 1986; Lausmaa et al. 1988; Baier & Meyer 1988; Binon et al. 1992), although the exact relationship between surface conditions and biological outcome still raises many questions. Several authors (Carisson et al. 1988; Orton et al. 1986, Gröbner-Schreiber & Tuan 1991; Buser et al.1991) have found a better bone-forming capability in vitro as well as in vivo around rough implants compared with smooth ones. Suggested explanations for these findings include more advantageous stress transfer and a better mechanical interlocking provided by the surface irregularities (Kasemo 1983) [12].

The various methods of surface treatments of titanium include

1) Surface texturing

Surface texturing of an implant is done to increase the surface area and provide a greater potential for interlocking with bone.

Titanium Plasma - Sprayed Coating (TPS)

Some of the titanium implants in use today (e.g., ITI screw, ITI Bonefit, IMZ) are coated with titanium powder, which is applied using a special plasma flame-spraying technique. At the same time, this creates a rough and also an enlarged surface on the implant body [7].

Sandblasting - Surface Etching (SLA)

Plasma spraying changes the smooth implant surface into a rough surface by adding material. It is also possible to roughen a smooth surface by “removing” material, for example via sandblasting, etching or special laser treatment (Ledermann screw implant, Frialit-2 implant)

Dual acid etching procedure

Surface roughness can be increased by using a dual acid- etching procedure of the

implant surface (e.g Osseotiote) using hydrochloric and sulphuric acids . However, the top part of the implant is left as machined, allegedly to minimize peri-implantitis.

Grit blasted and acid etched surface (Cellplus surface)

The novel Cellplus surface is grit blasted and acid etched at a high temperature (e.g XiVe implant). Sammons presented an in vitro comparative study in which different commercially available surfaces were compared with respect to cell attachment, migration, proliferation, and differentiation. The Cellplus surface was claimed to show the strongest cell adhesion and present de novo bone formation [13].

TiO_2-blasted titanium implants

Blasting with titanium-dioxide-particles (e.g. TioBlast, Astra Tech, Mölndal, Sweden) at room temperature is one of the methods used to make a rough titanium surface without adding foreign elements and changing the biocompatibility of the implant material [11, 14, 15]. This technique creates surface irregularities smaller than 100 μm by a plastic deformation.

Partially porous-coated titanium alloy dental implant designs

The root component of this implant incorporated a tapered truncated cone shape and a multilayered porous surface coat of beads of $TiAl_6V_4$ and the coronal 2 mm of this implant root had a machined surface to allow for some initial surgical trauma-related crestal resorption without risk of exposure of the porous coat to the oral environment[16].

Bioceramics blasted titanium implants

This is an **experimental surface modification** of titanium. The bioceramic mixture consists of 50% of a bio-vitro-ceramic (AP_{40}) and of a resorbable glass ceramic (GB_{14}). The glass ceramic GB_{14} with a composition of (in weight percentages) CaO - 30.67, P_2O_5 - 43.14, NaO - 9.42, K_2O - 9.42, MgO - 2.45 contains $Ca_2KNa(PO_4)_6$ as its main crystal phase (Berger et al. 1995). AP_{40} contained (in weight percentages) CaO - 31.89, P_2O_5 - 11.21, K_2O - 0.19, Na_2O - 4.6, MgO - 2.82, CaF_2 – 4.99 and SiO_2 – 44.3 and displayed apatitic phases with a mixture of fluroapatite and hydroxylapatite as well as wollastonite (calcium silicate) (Berger et al. 1989). The different components provide the basis for different structures and differences in the solubility of the components. Therefore, GB_{14} can be called a resorbable glass ceramic and AP40 a more stable ceramic [17].

Passivation

Passivation is commonly done on metal implants for the purpose of enhancing the oxide layer present and creating a surface less likely to break down and release metallic ions in service. The typical oxide layer on Ti is on the order of 5 to 10 nm. Passivation treatments in 40% nitric acid have been shown to increase the thickness of the oxide layer slightly, but do not always cause a significant improvement in corrosion resistance during in vitro

corrosion testing in a simulated physiologic solution.

Passivation of a surface with the action of an electric current is known as anodization, and the much thicker oxide layers resulting from this treatment however seems to be beneficial in enhancing corrosion resistance [10].

Oxidised implant

Another way of altering the surface characteristics is by enhancing the oxide layer of the implant surface. The excellent biocompatibility and corrosion resistance of titanium has been ascribed to the chemical stability of TiO_2 in biologic environments[18].

Anodized surface

The TiUnite (Nobel Biocare, Goreborg, Sweden) implant surface is anodized, i.e. it has been manufactured by ectrochemical anodic oxidation in galvanostatic mode, using undisclosed electrolyte [6]. As the implant surface contained phosphorus ions, some type of phosphoric acid could have been probably used as an electrolyte.

Porous anodized surface

The porous anodized implant surface was introduced by nanoPore, Out-Link, Due Carrare, Padova, Italy. Francesco Carinci et al. [19] in 2004 analyzed the $MG6_3$ osteoblastic-cell response to this nanoporous implant surface by means of a microarray technology. This resulted in the generation of a genetic portrait of the implant surface which can be relevant to better understand the molecular mechanism of implant osseointegration and serve as a model for comparing other materials.

Oxidized titanium screws coated with calcium ions

An electrochemically Ca ion-deposited oxidized titanium implant using macro arc oxidation method was evaluated which had substantially different chemical composition compared to hydroxylapatite, other calcium-phosphates, or other bioactive materials that typically contain SiO_2, CaO, and P_2O_5 plus additional oxides. This was an experimental design.

3) Experimental surface modifications of titanium

Fluoride-modified titanium implants

Fluoride treatment of titanium was introduced by Ellingsen [20]. It has been reported that surface modification with fluoride significantly increased the retention of conical titanium implants in rabbits after 4- and 8-week healing periods. When observed using light microscopy, the fluoride-modified implant surfaces appeared more firmly attached to bone than unmodified surfaces. In an in vitro study, fluoride- modified titanium surfaces adsorbed calcium phosphate crystals from a calcium and phosphate saturated solution. This phenomenon could not be observed for unmodified surfaces. These observations indicated that fluoride-modified surfaces have properties that may be beneficial for bone healing after implant placement [21].

Diamond-coated titanium implants using the microwave plasma chemical vapor deposition method

Diamond is known as the hardest naturally occurring material and is resistant to chemical and physical breakdown. It is an electrical isolator and could also be an advantageous coating to prevent the loss of particles and ionic passage. Coating titanium alloys with thin diamond layers may prevent damage to living tissues, while biocompatibility is retained. The use of diamond makes it possible to create an implant material with very high resistance to corrosion and erosion and a very low friction coefficient. Testing in cell cultures have shown that diamond layers on metal, regardless of the kind of metal, are not cytotoxic, even if the metal base by itself is toxic [22].

Ion implantation

Ion implantation technique comprises of a high-vacuum technology applied under controlled temperature conditions. The technique involves the bombardment of a surface with ions that have been previously selected and accelerated to high velocities thus modifying the surface to a depth of about 0.1 μm. The ions disrupt the surface of the material due to their high kinetic energy, penetrating and becoming implanted within its atomic network- a phenomenon that implies modifications in the most superficial layers of the material. The implanted zone forms an integrated part of the material, thus avoiding the risk of delamination associated with coating techniques. Furthermore, there is no material loss with such processes- a fact that affords advantages over material removal techniques [23]. The main benefit of ion implantation of titanium for dental implants, may be that the Ti-N surface can potentially increase the passive nature of the surface and thus the corrosion resistance[10].

Titanium implants complexed with bone morphogenetic proteins

Knowledge of the relationship between bone morphogenetic proteins (BMP) and bone regeneration arises mainly from studies of induced bone formation in heterotrophic sites or in tissue culture. The observations on BMP-induced bone formation demonstrated that BMP could diffuse to the nearby area immediately after implantation. In addition, the released BMP could induce undifferentiated mesenchymal cells to migrate, accumulate, proliferate, and differentiate into osteoblasts. This hypothesis was further proved by immunohistochemical, staining by use of a monoclonal antibody against BMP [24].

Other experimental surface modifications of titanium

Säberlich S et al. in 1999 conducted in vitro cell culture tests for assessing the tolerance of soft tissue to variously modified titanium surfaces. They observed that coating of the titanium surface using fibronectin produced optimization of cell growth and improvement in the adhesion of gingival fibroblasts to the implant surface[25].

4) Hydroxylapatite (HA) – coated titanium implants

Hydroxylapatite is a dense, nonporous polycrystalline material that becomes an integral part of living bone tissue. Research has shown that a biochemical reaction occurs between hydroxylapatite and bone and that the interface between bone and ceramic is stronger than either the bone or ceramic alone[7, 26]. Hydroxylapatite coatings consists of various percentages of crystalline hydroxylapatite, alpha and beta tricalcium phosphates (TCP), tetracalcium phosphate (TTCP), and calcium oxide.

To apply hydroxylapatite coatings on implant surfaces, various coating techniques are used, such as [27]

(1) Dip coating-sintering

(2) Electrophoretic deposition

(3) Immersion-coating

(4) Hot isostatic pressing (HIP)

(5) Plasma- spraying

(6) Ion-beam sputter coating

Although all methods suffer from some disadvantages, such as the adherence of the coating to the substrate material and the integrity of the structure of the coating, it was concluded from various publications that plasma-spraying and sputter-coating are the mostly used methods for producing hydroxylapatite films on implants [27, 28] (Lacefield 1988, Solnick-Legg and Legg 1989, Wolke et al. 1992, Koeneman et al. 1990).

5) Fluroapatite /Hydroxylapatite coating

In vivo studies demonstrates that, with preservation of all favorable bioactive properties of hydroxylapatite coatings, fluroapatite coatings are stable and do not show signs of dissolution or degradation (Denissen 1990; Dhert 1992). A bilayer coating, consisting of the relatively reactive hydroxylapatite and the stable fluroapatite could combine the biological characteristics and benefits of both ceramics, thus creating a potentially ideal bioactive implant surface. The behavior and clinical performance of such implants (Biocomp Industries, Zwaag, the Netherlands) are being investigated, both in vitro and in vivo [29].

7) Bioglass

Bioglass, a type of bioactive ceramics is a typically surface-reactive material. It forms a reaction layer of up to 150 μm quickly on implantation, followed by the precipitation of a carbonated hydroxylapatite surface layer (Hench and Andersson, 1993). Bioglasses are only rarely used as coatings for higher-strength dental implant materials, but have been shown to increase the bone-bonding ability of the implant (Li et al., 1995)[10].

8) Bonding of osteoinductive agents to ceramic surfaces

Tethering or bonding of osteoinductive agents such as bone morphogenic proteins to ceramic surfaces has been accomplished, but no clear superiority of a treated implant over a non-treated implant has yet been proven (Lind et al., 1996)[10, 30] .

Future developments of biomaterial surfaces will include more and more sophisticated and multi-(bio) functional surfaces. The latter include the following aspects, partly illustrated by the (figure 1) [31].

(i) An almost revolutionary development is ongoing with regard to the possibilities for building up the micro-architecture of surfaces. This will be exploited to optimize the 3-D surface architecture, with the intention of functionally matching different biological entities such as proteins, cell processes, and whole cells. This matching aims at recognition at both the molecular and cell size levels

(ii) The micro-architectural functionality mentioned under (i) will be combined with corresponding chemical patterns working in synergy with the micro-architecture.

(iii) Controlled surface porosity will provide new functions, influencing cell-surface interaction, transport of nutrients, and signal substances, release of functional additives, etc.

(iv) Programmed dissolution of multilayered surfaces provides new opportunities to optimize the biomaterial surface for different periods of the healing-in phase. Such time programming of the surface can be used to expose different micro-architectures, different chemical patterns, and different porosities at different times. It also provides the opportunity of time-programmed release of different inorganic and organic stimuli, like growth hormones.

(v) By the use of soft, viscoelastic overlayers, the mechanical properties of surfaces at the macro- and microscale can be optimized for the interface. Such overlayers may involve, e.g., biomembranes and hydrogels.

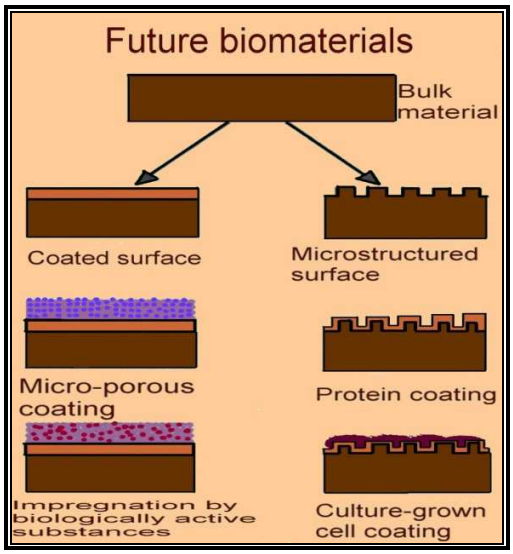

Figure-1 Surface modification will play a major role in the generation of future medical implant materials. Some ideas are schematically illustrated, where biologically active as well as time and functionally programmed surfaces will meet the needs of cells and tissues at the interface at different times during the healing process.

Laser patterning

An entirely different method for making surface patterns is based on the possibility of focusing an intense laser beam at certain spots on a surface, where the high beam intensity causes evaporation of the material. By this approach, pits can be produced down to 1~µm, i.e. in the size range of interest to match cell sizes. By controlled motion of the beam (either by using clever optics or by sample motion), pre-designed patterns can be made. However, it is impractical to pattern a surface, e.g. an entire dental implant, by ablating one pit at a time. This problem can be circumvented by the use of a kinoform [31].

A kinoform is a diffractive optical element (a computer-generated micro-optic component that uses diffraction to manipulate light) which diffracts a laser beam into multiple beams at controlled, predetermined positions (Lesem et al. 1969; Ekberg et al. 1991; Larson et al. 1994).

Advantages of the laser technology

An advantage is that the laser can be targeted precisely and with predetermined angulations (e.g., apical, coronal, or perpendicular o the surface). Such laser technology makes possible the creation of regularly oriented micro- retention in contrast to the completely nonoriented surface roughness configurations that are produced, for example, by titanium plasma spray coating or roughening by means of sandblasting [7].

Although experimental studies to date have provided promising results (Schmitz 1991); additional research will be needed before conclusions can be drawn about whether this type of implant surface configuration actually has any positive influence on the long-term stability of endosteal implants in vivo[7].

Lithographic patterning of surfaces

More recently, much more refined lithographic techniques (Hirono et al. 1988; Chehroudi et al.1990; Singhvi et al. 1994; Meyle et al. 1995; Nakayama and Matsuda, 1995) and techniques based on, e.g., sol systems (Douglas et al., 1986; Pum et al., 1991; Hulteen and vanDuyne, 1995; Hanarp et al., 1999) are being investigated for preparation of a biomaterial surface.

Principle of the lithographic techniques

The basic principle of the lithographic techniques (figure 2 a, b) is, first, to cover the surface with a radiation-sensitive film which is usually a polymer called **'resist'**. The next step is to expose certain areas of the film to a beam of radiation which modifies the polymer properties at the irradiated areas. The latter can then be removed by dissolution, leaving a pattern of polymer on the surface that serves as a mask for surface treatment of the uncoated areas.

The exact pattern on the surface is produced, for example, by illuminating the polymer film through a pre designed mask (in the case of photolithography; figure 2 b, right) or by steering the radiation beam to desired positions (as in electron beam lithography; figure 2 b, left).

The surface treatment of the areas where the polymer was removed can be simple etching (to create pits, grooves, etc., of controlled shape and size; figure 2 a, lower left) or deposition of overlayers (figure 2 a, lower right) by, e.g., evaporation or self-assembled monolayer. The smallest feature size obtainable by conventional photolithography is around 0.3 µm, while electron beam lithography can produce features down to below 10 nm, depending on processing procedures and materials being patterned.

Drawback of electron beam lithography

One drawback of electron beam lithography is that it is slow (to pattern a 1-cm^2 area with features of these dimensions would take hundreds of hours; additionally, features are "drawn" on the surface one at a time) and very difficult to execute on non-planar surfaces, due to focusing problems. However, due to the need for increased miniaturization in microelectronics, the technology development is very fast in this area, and faster equipment is already appearing in the market [31]

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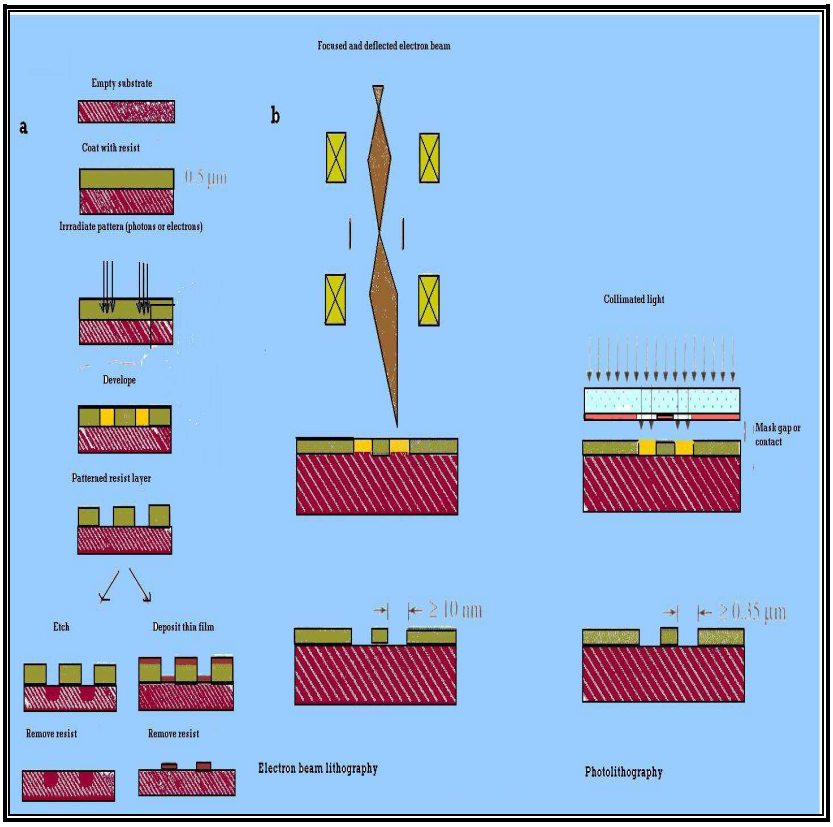

Figure-2 (a) Basic step-wise production procedure for lithographically fabricated surfaces, where the final steps are typically etching a pattern into the substrate (left) or depositing a patterned thin film onto the surface (right).

(b) Comparison of electron beam lithography (left) and photolithography (right) in

***Colloidal-based fabrication* techniques**

A method for increasing the speed of patterning surfaces with nano-sized features is the use of colloidal particles as lithographic masks. Colloidal particles of different materials can be produced with monodisperse size distributions down to nm sizes. By control of the properties of the solution in which the colloidal particles are kept, it is possible to control how such particles attach to a surface (Johnson and Lenhoff, 1996; Persson et al., 1998; Hanarp et al., 1999). It is possible, for example, to deposit monolayers of uniformly distributed particles (Krozer et al., 1995). The particle density in the monolayer can be controlled by the salinity (Hanarp et al. 1999) and pH of the solution. Also, multilayer of particles can be deposited (Krozer et al., 1995), thus constituting a porous surface where pore size is scaling with the particle size. Such mono- or multilayer of deposited particles (e.g., metal oxide particles like SiO_2, TiO_2, polymer particles, etc.) are of interest themselves as biomaterial surfaces through the topographic patterns and the porosities they represent [31] (Hanarp et al., 1999).

Roxolid™

Roxolid™ implants presented by Straumann is an alloy of titanium and zirconium with an SLA active surface topography and was designed specifically for dental implants. Rigorous tests in Straumann laboratories have shown that this new material has a higher fatigue and tensile strength than pure titanium (grade 4 annealed and cold worked), and is the current material of choice for dental implants. In addition, preclinical study results have indicated that the bone integration with Roxolid was better than with pure titanium (grade 4) [32]. This combination of enhanced strength and osseointegration opens the door for a new generation of small diameter implants, which may be particularly advantageous in situations where there is limited space between teeth, and when preserving existing bone and vascular supply is important. A further potential advantage could be the use in thin alveolar bone. Engineered and developed by Straumann, Roxolid has been undergoing a broad program of clinical trials in 9 countries. It is one of the largest clinical research programs ever undertaken by a dental implant company prior to marketing.

SUMMARY AND CONCLUSION

Albrektsson defined osseointegration as living bone in direct contact with an implant surface at the light microscopic level. Studies have shown that osseointegration can be achieved 85% to 90% of the time with the use of a biocompatible material, for example - commercially pure titanium. Titanium offers an ideal combination of characteristics, having all the advantages of a bulk metal and the wear and corrosion-resistant qualities of its stable oxide layer. This oxide layer aids in the bonding between the extracellular matrix secreted by the host tissue and the implant surface, producing a stable implant-tissue interface.

Studies have also shown that the implant-tissue interface can be influenced by various different methods of surface treatment that affect the biologic response to

the implant surface. Changing the physical and chemical characteristics of the implant surface can affect the critical implant-tissue interface because most primary interactions take place over atomic dimensions. Methods of changing the surface include alteration of the micro-structure of the implant surface, alteration of the physicochemical parameters of the surface, and biochemical methods of surface modifications.

A wide range of materials are available. The clinician should consider all the available information on new materials and design aspects of dental implants before embarking on prolonged clinical trials.

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Review Article

AVOID THE WORST SAFETY FIRST: A REVIEW ON OCULAR HAZARDS IN DENTISTRY

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Abstract

Infection control and disinfection is a current issue in dental field these days. Along with other personal protective equipment , ocular safety must not be neglected. There have been reports regarding ocular injuries among Dental Health Care Personnels, which calls for the need of ocular protection in dental practice. Variety of ocular safety measures are available, which can be instituted in our daily practice to prevent the risk of ocular injuries. This article briefly deals with the ocular injuries encountered in dental office and various protection measures to reduce the risk of such exposures.

Avoid The Worst Safety First: A Review on Ocular Hazards in Dentistry

Introduction

Although modern dentistry is considered among hazardous occupations, but still many risks like percutaneous exposure incidents, exposure to infectious agents including bioaerosols, musculoskeletal disorders, eye injuries, vibration induced neuropathy, exposure to radiation etc remain in dental practice which continue to challenge this status.[1]

In the past, despite the knowledge of infectious diseases, Dental Health Care Professionals were not concerned much about the occupational risks and very few of them focused on wearing masks and gloves.[2]

As awareness has increased about infection control and personal protection in clinical settings, both the dental professionals and patients have changed their perception about infection control measures. Wearing of gloves and masks now appear to be regular practice by all dental professionals almost in all the parts of the world, but the scenario is not similar for eye protection. Ocular injuries during dental practice may have serious and long term effects and sometimes lead to loss of vision in one or both eyes.[1] The potential ocular adverse effects may effect both the staff and patients. Review of literature reveals high incidence of ocular injuries among dentists. Despite of

American Dental Association (ADA) & Occupational Safety & Health Administration (OSHA) guidelines on eye safety, various studies conclude that majority of dentists do not institute proper eye protection measures[2,3,7,12] rendering them at high risk of ocular trauma which may hamper or effect their future dental practice.

Types of Ocular Hazards in Dentistry

The dental office can be a source of ocular injury due to mechanical, chemical, microbiological and electromagnetic insult. Accidents resulting in an injury to the eye and face of dentists, auxillaries and patient may occur at any time during regular clinical practice.[3]Symptoms of direct mechanical trauma often correlate with severity of trauma and its type and may include pain, epiphora and blurred vision. Penetrating injuries may be serious, causing damage to vital structures of eye and calling for the need of surgical intervention.

Apart from mechanical trauma from steel, amalgam or gold particles, dental personnel are at high risk of microbial infection from saliva, blood, calculus and infected tooth material. Dental turbines create aerosols of bacteria in areas upto four feet from patients mouth and bacteria may remain in suspension upto 30 minutes.[4] Dental plaster contains small quantities of lime and quartz which can also damage eye.[3]

There's also a risk from various chemicals used in clinical dentistry, particularly sodium hypochlorite, phosphoric acid, trichloractetic acid and chromic acids. Chemical injuries may lead to corneal damage, visual discomfort and impairment. Apart from acids during laboratory procedures, methyl methacrylate monomer, if splashed into eye can cause a painful reaction.[3] Curing light radiations also have adverse effects on eyesight which is the most important aspect of biological injury from curing radiations.[5,6]

Common ocular injuries along with their causes and effects have been summarized in the following table.

Type of injury	Potential causes	Signs & Symptoms
Physical injury	Foreign objects like • Dental plaster particles • Pumice particles • Orthodontic wires • Sharps • Acrylic shavings during trimming etc	• Acute pain • Laceration of cornea or eyelid • Altered or blurred vision
Chemical injury	• Methyl methaacrylate monomer • Endodontic irrigants like	• Mild conjunctivitis • Epithelial erosion • Keratopathy

	NaOCl • Acids or alkalis • Concentrated disinfectants	• Blindness in severe and heavy exposure
Infective lesions	• Aerosols • Accidental splash and splatter containing infective blood and saliva • Calculus during scaling • Bony pieces during osteotomies etc	• Conjunctivitis (bacterial or viral) • Keratitis (bacterial or viral) • Irritation • Discharge (purulent or non purulent) • Dendritic ulcers • Systemic infection in case of exposure to Hepatitis B & C virus and HIV
Photoinjuries	• Curing lights • Lasers	• UV mediated ocular damage • Blue light mediated ocular damage • Burns • Retinal injuries • Irreversible retinal burns • Blindness • Impaired eyesight
Radiation	• Dental X-rays • CT Scan	• Radiation induced cataracts

Incidence of Work related injuries among dentists :

Various studies have been conducted in different parts of the world to evaluate the risk of ocular hazards in dental practice and use of proper eye protection during various dental procedures both by staff and patients.

Khalid et al did a study on prevalence of ocular injuries among dental personnel in Saudi Arabia and concluded that both dentists and technicians were highly prone to conjunctivitis. They found that one month prevalence rate of ocular insult among dentists was 42% . In the same study it was

concluded that the prevalence of conjunctivitis and foreign body was high among irregular eye protection wearers.[3]Farrier et al did a pilot study on local General Dental Practicioner's of South Wales area and about 48% of participant dentists had experienced eye injuries during their regular practice. 59% of them had to get hospital treatment for the incident and 75 % of the injuries were due to not wearing of eye protection. Further 52% of injuries were due to scratching of eye or amalgam particles entering the eye, 17% were due to acrylic, 11% were because of prophy paste, 16% were caused by porcelain and rest 4% were due to accidental splash.[2] In an another survey of the use of Personal Protective Equipment and work related symptoms among dental staff, in total prevalence of eye irritation or watering was 16.2%. Among dentists the incidence of conjuctivitis was 16.4% and among nurses and hygienists, it was 54.8%.[7]There has also been a report of lawsuit against a dentist related to serious ocular infection to a patient due to accidental splash of water in the patient's eye, possibly linked to water from a dental handpiece.[8] Many of such incidents go unreported or the dental health care personnels do not pay attention to use of suitable personal protective equipment like proper eye wears or prescription glasses with side shields, putting themselves at a high risk ocular hazards which may cause serious problems.

Protection of Eyes:

Eye protection during dental procedures is very important to decrease the prevalence and incidence of work related eye injuries to dentists and technicians as well as patients. Most common eye protection measure is to use safety glasses. There are three types of protectors like safety spectacles, face shields and goggles.[9,10] Primary protectors are safety spectacles i.e they can be worn alone or in conjunction with some secondary protector and it is advisable to wear safety spectacles with side shields and top shields(Fig 1). Goggles are also available that fit around wearer's eyes and provides a tight seal protecting the eyes from almost all types of hazards(Fig 2). Faceshields protect all or part of face along with eyes but they do not protect from impact hazards and are considered as secondary protectors and have to be used with other Personal Protective Equipment and provides best protection from splash and spatter(Fig 3).

The use of personal glasses may be a suitable means of protection for clinical staff and patients. Personal glasses should have an adequate frame diameter to shield the ocular area and should preferably have side shields to further avoid ocular insult, they should also be suitable for UV protection. However modern prescription glasses are very small and narrow rendering them unsuitable for eye protection.[2]

Procedures involving dental lasers, should be done using proper safety eyewears. Optical density is one of the most important factors to consider when choosing laser eye protection. The attenuation should be to reduce the beam exposure to the eye to relatively safe levels. Laser protective eyewear is intended to provide a level of

protection that may be used to stare directly into the beam.[11]

Fig 1 : Protective eye wear with side shields

Fig 2: Protective goggles that tightly fit around operators eyes

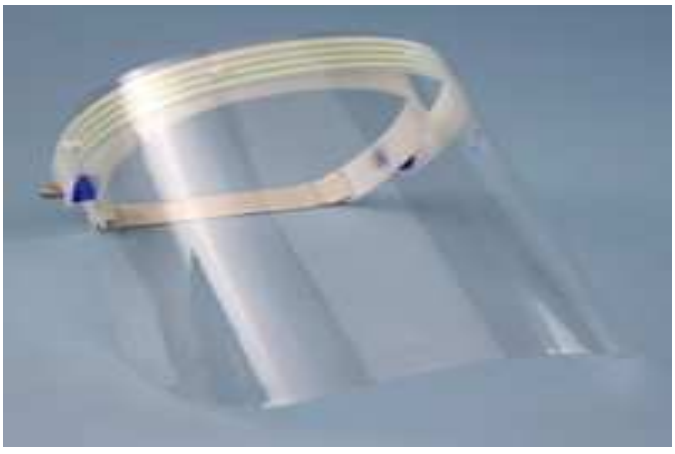

Fig 3: Face shield may also be used as secondary protector along with other PPE

Advantages & Disadvantages of various types of eye protection		
Type	Advantages	Disadvantages
Safety glasses & Goggles	• Appropriate protection due side and top shields • UVand Laser protection • Cost effective • Variety of sizes to chose, can be easily used with pediatric patients • Can also be used with surgical loupes	• Optically imperfect • Tinted lenses may decrease visibility • Inadequate UV filtration with clear lenses
Face shields	• Comfortable to wear • Protects whole face along with eyes from splatter • Easy for communication with patient as whole face is visible • Cost effective • Shields can be changed with every patient	• Optically imperfect • No UV protection • Can't be used for patients • Problem of vapour accumulation • Difficult to use with surgical loupes
Prescription glasses	• Optically perfect • Side shields and degree of UV protection can be added • Not frightening for child patients • Can be used with surgical louped	• Inadequate dimensions • Need for additional sideshields • No UV protection

Guidelines for eye protection

Occupational Safety And Health Administration (OSHA) requires eye and face protection that meets the ANSI (American National Standard Institute) standards for occupational & educational eye and face protection. OSHA requires the use of appropriate eye or face protection to shield DHCP from flying particles, potentially infectious materials, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapours or potentially injurious light radiation. Eye protection must include front top and side protection. In case of DHCP's wearing prescription glasses or lenses, eye protection suitable for wearing over prescription glasses should be used.[9,10]

The American Dental Association (ADA), British Dental Association (BDA) and Center of Disease Control (CDC) recommend the use visors , manufactured safety glasses or personal glasses with additional side shields. Eyewears during use of dental lasers must comply with The Personal Protective Equipment at Work Regulations SI 1992/2966 (HMSO 1992) and the British Standard BS EN 207:2009 (BSI 2010) (24).[11] Apart from use of PPE methods of reducing exposure to aerosols should also be incorporated like disinfection of water flowing from handpieces, maintenance of handpieces by following the principle "do not disinfect when sterilization is possible".[9]

Discussion

From various studies it is clearly evident that dental professionals are at a high risk of both ocular infections as well as ocular injuries. To prevent such type of accidents various protective measures should be incorporated in daily practice. Many type of eyewears are available, and dentist should make a selection between all the available options keeping in mind the exposure risk for every procedure. Moreover while selecting the eyewears, one should also keep in mind that it does not affects the efficiency of the operator as well as precision and accuracy of the procedure. It has been documented that visual clarity is most important factor while selection of eyewears.[12]

It's the responsibility of the dentist to provide proper eye protection gears to his staff members also (Hygienist, technician, nurse etc), so that there is a decreased risk of ocular insult to them. In a good clinical practice patient should also be provided with protective eye wear in almost every procedure, if it's acceptable to patient.There should be an eye wash area in clinical settings for immediate care in case of any accidental exposure. The clinical setting should be equipped with first aid which may include anti- bacterial eye drops. Potential exposure should not be neglected and an ophthalmologist may be consulted for further treatment.

In modern dental practice, safety concerns may be a paramount to avoid injury and litigation. The principle of 'do no harm' must also apply to patient for injury prevention.

Conclusion

To maintain a healthy state its very necessary to practice a healthy dentistry. Infection control awareness is increasing,

and dentists are focusing on proper sterilization and disinfection protocols but still eye safety remains an area, which is less talked about and there's not much awareness among the dentists specially in India. It is advisable to use proper eye protection gears for the Dental Health Care Professionals in general dental practice as well as advanced laser dental procedures. As it is well said ' Prevention is better than cure', its our duty to practice a safe dentistry and prevent cross infections as well as severe injuries which may affect our future practice.

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Original Article

Polymerase Chain Reaction –An attempt to trace HPV 16 & 18 from the paraffin embedded sections of oral squamous cell carcinoma!

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Abstract:

It has already been proved that head and neck carcinomas can be HPV positive or HPV negative, both of them are found to be two distinct entities. Under this background, we framed a pilot study to check whether there is any presence of HPV 16 and 18 genome, in histologically confirmed, formalin fixed and paraffin embedded sections of oral squamous cell carcinoma archived from the department, the subjects of which were free of any habits. For that we established and optimized a PCR assay for the detection and discrimination of HPV particles of our interest. The results of our study showed that detection of HPV 16 and 18 genome depends upon the type of specimen used fresh/paraffin embedded, geographical data, low risk group and finally statistically significant sample size to minimize attrition to detect the delicate viral particles.

Key words: Human papilloma virus, Oral squamous cell carcinoma, Polymerase chain reaction, Paraffin embedded formalin fixed sections.

Introduction:

The Centers for Disease Control estimates that nearly half of all sexually active individuals acquire an HPV infection at some point in their lives, at least by age around 50[1,2]. Some of these viruses could be involved in the etiology of OSCC, and evidence for the role of different viruses in this group varies from very weak to very persuasive forms. Edward J.Shilltoe 2009 study shows that Papilloma viruses are probably involved in the etiology of some carcinomas, particularly those of the oropharynx.[3]

A rise in incidence of oropharyngeal squamous cell carcinoma, specifically of the base of the tongue, lingual and palatine tonsils, in white men younger than age 50 years who have no history of alcohol or tobacco use has been recorded over the past decade.[4] Epidemiologic and molecular studies have identified HPV16 and to a very less percentage HPV18 as causative agents of biological carcinogenesis in these patients[5,6]. High risk HPV 16 and 18 were declared as human carcinogens by the international agency for research on cancer. This is based on immunological investigations and hybridization techniques

worked upon with DNA of HPV.[7,8,9]. With this background we framed our study to check whether there is any expression of HPV 16 and 18 genome in the FFPES of OSCC retrieved from the department archives, the subjects of which were free of any habits.

Materials and Methods:

Tissue blocks from 15 cases of surgical excision of OSCC were randomly selected from the archives of the Oral and Maxillofacial Pathology, Saveetha Dental College and Hospital. All were routine diagnostic surgical specimens that had been fixed in buffered formalin and embedded in paraffin. Specific fixation times were not known for individual specimens, but typically varied between 18-24 hours.

DNA isolation from FFPE tissue sections of 10 micron size was performed using a QIAmp DNA Purification kit following the protocol described in the Lesnikova et al.2010 study.[10] For checking the integrity, concentration and purity of the extracted DNA spectrophotometry was used. Amplification reactions were performed with an AmpliTaq Gold PCR kit (Applied Biosystems, CA). Amplification reactions were performed with the Mini PCR system.

To evaluate the quality of the DNA extracted from the study specimens for amplification by PCR, all samples were tested for the control, housekeeping gene b-actin with gel electrophoresis using ethidium bromide stain agarose.

Results:

Samples used in our study did not show any expression for HPV 16 and 18. For confirming our results Immunohistochemical analysis was carried out using the same specimens, using the primary antibody agent HPV 16 (Biogenix) and secondary antibody HRP 1 step polymer.

Discussion:

Tobacco, alcohol, poor oral hygiene, and genetics remain important risk factors for head and neck tumours overall, but HPV is now recognized as one of the primary causes of oropharyngeal squamous cell cancers. The non expression of HPV in our study samples could be attributed to the following facts: Low risk groups, Cases of moderately differentiated carcinoma, or those without any habits. Literature supports that paraffin embedded specimens of cervical carcinoma shows denaturation of viral genome that will affect the sensitivity of final results.Sensitive and accurate detection of HPV genotypes in such archival tissues could be affected, as DNA is often degraded as a result of long and poor storage conditions. Such damage to DNA includes chemical modification, cross-linking, and fragmentation, all of which can reduce the efficiency of PCR amplification. (11, 12)

HPV DNA in cancer biopsy specimens was detected less frequently among tobacco smokers and pan chewers and more frequently among subjects who are attributable to changes in sexual norms.[13] Variation in habits in different geographical areas too determines the percentage of HPV in oropharyngeal cancers.

In the oral environment HPV16 manifests itself primarily in the posterior regions such as the base of the tongue, the oropharynx, the tonsils and the tonsillar pillars.[14] The site from which samples are chosen for our study too is a critical factor in determining the positivity of our study.

QIAmp DNA FFPE tissue Purification kit is used because paraffin embedded specimens are proved to be with least amount of genome, low molecular weight than fresh specimens and the kit itself is optimized for purification of genome from paraffin embedded specimens. Kunjan *et al* study shows that all the ORSCC samples that they have chosen for their study were negative for HPV.[15] Head and neck carcinomas can be of two groups, HPV positive and HPV negative.[16] It is based on the previously mentioned factors. Thus both are two distinct entities.

Conclusion

The difficulty in providing true causal evidence of HPV 16 and 18's role in oral carcinogenesis lies in our limitation in the molecular analysis of HPV and lack of understanding of the significance of mechanisms by which HPV leads to oral carcinogenesis. Further studies are necessary for the contribution of HPV in oral carcinogenesis to be better demonstrated.HPV-associated head and neck squamous cell carcinoma seems to be a distinct clinical entity, and this malignant disease has a better prognosis than HPV-negative tumours, due in part to increased sensitivity of cancers to chemotherapy and radiation therapy.

List of abbreviation: Human papilloma virus: HPV, Oral squamous cell carcinoma: OSCC, Polymerase chain reaction: PCR, Formalin fixed paraffin embedded sections: FFPES

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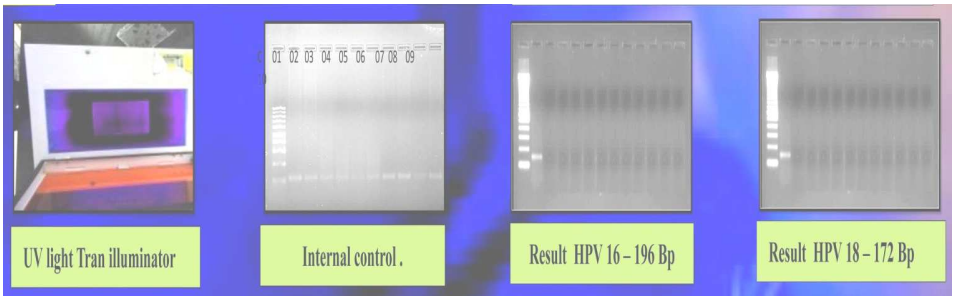

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General Article

Dr. VULNERABLE B.D.S, M.D.S

Dr. Manju Rudy (WDC Chairperson of IDA Attingal br.)

ONE STORY OF LOSS

"***A thirty-year-old dental surgeon who worked until the 35th week of pregnancy in a private clinic in which mercury vapour concentrations were in excess of the threshold limit value (TLV) had been detected, gave birth at 42 weeks to a small-for-dates baby with severe brain damage.***" The baby died nine days later.

ABSTRACT:

Women in Dental profession may be at risk for exposure to numerous workplace hazards. There are currently no specific standards for dentistry, but rather workplace hazards that may apply to dentistry are addressed to the entire healthcare industry. However, there are numerous different materials, chemicals, and supplies commonly used in the general dentist's office that are left out of the expansive collection of workplace hazards.Concerns arose about the health risks from dental materials since at least the 1960s. The medical literature and government agencies have both examined and made recommendations to reduce risk of miscarriage, birth defects, and reduced female fertility at different levels of exposure to several hazards (materials, chemicals, supplies, radiation, etc). Fortunately, several steps can be taken to control the level of exposure from these agents. These include, but are not limited to, handling the agents properly, monitoring the levels of exposure, using devices to lower the levels, and properly disposing of the agents.

INTRODUCTION

The authors go on to disparage the level of education within the profession about these dangers: "In spite of discussion in the profession regarding mercury hazards little mention has been made of the foetotoxic effects of mercury vapour. Some 80% of inhaled mercury vapour is retained: Animal data show that such atomic mercury dissolved in blood rapidly crosses the placenta.

The cold, hard truth about all forms of mercury is that they damage developing fetuses, especially the brain. In addition, it is well-known that the fetus is much more sensitive to mercury toxicity than the mother, since in outbreaks of mercury poisoning "mothers with no symptoms of nervous system damage gave birth to infants with severe disabilities.

Methylmercury, which can form in the mouth when elemental mercury vapor is present due to dental amalgam or ambient mercury vapor, is even more toxic to the human embryo. The EPA states that methylmercury "can adversely affect a baby's growing brain and nervous system. Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills have been seen in children exposed to methylmercury in the womb.

An increasing number of researchers caution against the use of mercury around pregnant women: "As always, during pregnancy, female dental healthcare professionals may be exposed to unsafe levels of mercury, which are known to damage the developing fetal brain.

FROM MOTHER TO CHILD

Does exposure to mercury from dental amalgams really lead to fetal damage? We know that even a small amount of mercury in the womb, whether elemental, ionic, or organic, harms the developing child. Now that it has been proven that the dental amalgam leaks mercury vapor into the body of its host, some pro-amalgamists have taken to claiming that elemental and ionic mercury does not pass through the placenta (since methylmercury does, without a doubt).

There are, however, numerous studies proving that all forms of mercury find their way from the mother's body to the developing fetus. For example, one Swedish study specifically shows that inorganic mercury levels in the fetus correspond directly to the number of amalgam surfaces in the mother.

In fact, several studies, show the link between the number of amalgam surfaces in a mother's mouth with the mercury in the blood, hair, and urine of the newborn child:"Placental, fetal, and infant mercury body burden correlates with the numbers of amalgam fillings of the mothers. One study found the same correlation between maternal amalgams and the mercury in the kidneys, liver, and cerebral cortex of infants.

Elemental mercury is transported freely across the placenta. "Human placenta does not represent a real barrier to the transport of Hg(0); hence, fetal exposure occurs as a result of maternal exposure to Hg, with possible subsequent neurodevelopmental disabilities in infants." In women with amalgam surfaces, mercury levels are also high in the umbilical cords.

And even once the baby is born, the problems don't stop there. Breast milk from mothers with amalgams has also been shown to contain mercury in proportion to the number of amalgam fillings they have. This German study sums it up:

"The higher Hg burden of infants' tissues from mothers with dental amalgam, as reported previously, must be explained by a prenatal transfer of Hg from the mother's fillings through the placenta to the fetus, followed by a redistribution of this Hg in the body of the newborn, and an additional burden via breast milk.

REPRODUCTIVE FAILURE IN DENTAL STAFF

So, there's sufficient evidence showing that fetuses and newborns receive mercury from maternal amalgams. What about pregnant women in the dental profession? Is exposure to ambient mercury vapor, even if within legal limits, an acceptable risk?

Several studies have noted the low fertility rates among female dental professionals. One study found that female dental assistants who prepared 30 or more amalgams per week were only 63% as likely to become pregnant as the control group (measured by the number of menstrual cycles it had taken them to become pregnant). They also reported increased "abnormalities of the menstrual cycle including painful menstruation and changes in bleeding patterns and menstrual cycle duration among workers exposed to mercury."

Sadly, another study reported a "significant, positive association between TMLs [Total Mercury Levels] in the hair of exposed women and the occurrence of reproductive failures in their history." They suggest that "dental work could be another occupational hazard with respect to reproductive processes."

CONCLUSION

The fetotoxic effects of mercury vapor in the dental profession are becoming increasingly clear. Inhaled mercury vapor from the preparation and agitation of amalgams is absorbed by the lungs, enters the blood stream, and from there begins to wreak its havoc. It may even be deposited in the saliva, where it is converted into methylmercury by oral bacteria, an extremely poisonous compound.

Because of the rising number of experts who warn pregnant women against the dangers of mercury vapor, the dental profession in the U.S. may eventually be forced to change its policies: "The possibility of a relationship between occupational exposure during pregnancy and untoward effects on the foetus resulting in miscarriages, perinatal death and foetal abnormalities has been studied; although not conclusive, results indicated a higher incidence of adverse pregnancy outcome."

These authors strongly suggest that pregnant women working in the dental office, “should not be occupationally exposed to air concentrations of mercury vapor greater than 0.01 mg. per cubic meter." This is 20% of the current legal limit.

With all this evidence, and considering what is at stake, can we agree to take the right steps towards a future that prioritizes the health and welfare of our own families over the agenda of an entrenched and irresponsible professional community?

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Case Report

Multiple Dens Invaginatus- A case Report

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Abstract

Dens in dente is a developmental malformation resulting from invagination of the crown before it is calcified. The anomaly most frequently affects the permanent maxillary lateral incisors. Multiple dens in dente involving maxillary incisors and mandibular second premolars bilaterally is an unusual presentation. Here, in this article, a case of multiple dens-in-dente involving maxillary incisors and mandibular second premolars is reported.

Introduction

Dens 'invaginatus' or dents in 'dente' also known as 'dilated composite odontome results from deepening or invagination of the enamel organ into the dental papilla which begin at the crown often extends to the root, before the calcification of dental tissues[2]. It can occur within the crown or root although crown invaginations are more common[3]. The first observation of dens in dente dates back to 1856[4]. It may appear in the deciduous, the permanent dentition and even in supernumerary teeth. The reported incidence of dens invaginatus ranges from 0.04% to 10%[5]. Bilateral occurrence is reported in 43% of reported cases[6,7, 8]. An extensive review of literature determined that dens invaginatus was found in the maxillary lateral incisors in 42.2% of cases followed by an incidence of 15.5% in maxillary canines[9].

The etiology of dens invaginatus is the subject of controversy. According to Pecora et al[10], the varied nomenclature occurs probably due to the lack of consensus in relation to the cause of these alteration and varied names reflect the different opinion as to its etiology.According to Kronfield ", the mechanism of formation may be retardation in the growth of a portion of the enamel that occurs while the surrounding dental tissue continues to grow normally. Swanson and Mc.Carthy [12] suggested that the proliferation of the enamel organ cells causes an ingrowth of the enamel organ apicallv into the dental papilla. This proliferation occurs during the stage of differentiation of the developing tooth germ at the inner epithelium[12]. Atkinson [13] suggested that local stimuli to the tooth germ caused the formation of dens invaginatus. Rabinowitch [14] hypothesized that it may be formed by continued differentiation of some cells of the inner enamel epithelium that remain attached to the developing tooth.

Different classifications have been suggested to describe this anomaly. The first documented attempt to classify dens invaginatus was by Hallet (1953).[15]Some classified it as small or incipient and true dens invaginatus [16, 17, 18]. A classification

based on crown and root morphology includes a conical crown with a dilated root, a normal crown with dilated root, a dilated crown with a normal root and a combination of dilated crown and root. The predominant type is that of a conical crown with a dilated root found in 48.5% of all cases and the rest of the cases are divided among the other 3 types [19]. Depending on the site of invagination , it has been classified as the invagination Oehlers (1957 a)it has been classified into three classes as determined by how far they extend radiographically from the crown into the root.[20]

- Type 1 – Invagination is minimal,enamel lined and doesn'textend beyond the level of amelocemental junction.
- Type 11 – Invagination is minimal, enamel lines; extends into pulp chamber.
- Type 111 A – Invagination extends through the root and communicates laterally with the PDL space through a pseudoforamen.No communication with the pulp.
- Type 111B – Invagination extends through the root and communicates with the PDL space at the apical foramen.No communication with the pulp.

Case report

A 14 year old boy reported to our department, complaining of pain in relation to lower right mandibular body region. He gave a history of attempted extraction of lower right second premolar in a local hospital difficulty. No history of trauma was elicited & and clinically no caries was evident Percussion tenderness with grade II mobility was noted on 45. No abnormality was noted in the dentition clinically. An intraoral periapical radiograph of 45 was taken which revealed an invaginaion of enamel extending from the crown to beyond the cemento enamel junction with periapical radiolucency. The root was dilacerated (Figl). A panoramic radiograph was taken for full month evaluation. It revealed multiple invaginated teeth mainly maxillary incisors and mandibular left second premolar in addition to the mandibular right second premolar (figll). Periapical radiographs of maxillary incisor region revealed large conical crowns with short roots & multiple invaginations involving both central & lateral incisors. Intraoral periapical radiographs of left mandibular premolar revealed invagination with a periapical radiolucency. Percussion tenderness was elicited clinically is left premolar also. Both mandibular 2nd premolars were classifed as (type III-Oehlers), central incisors as (Typel) & lateral incisors as Type II. Since the patient was not willing for endodontic treatment, & preferred extraction, the right premolar was extracted and was sent for histopathology.

Discussion

Dens in dente present different anatomic configurations. The reported prevalence of adult teeth affected is between 0.3% and 10 % with the problem observed in 0.25% - 26.1% of in dividuals examined.[21]It is more common in maxillary lateral incisors; however unusual

presentations have been reported in the literature. Takeda *et al*[22] reported a case of multiple dens in dente associated with craniovertebral anomalies-Dens in dente with mandibular premolar involvement was reported by Karaca *et al* [23].Involvement in four quadrants was reported by Ergul *et al*[24]. An unusual case of bilateral talon cusp of Maxillary incisors with dens in dente was reported by Desousa *et al* [25]. A rare presentation of dens invaginatus in a primary molar has also been reported.[26]

Dens invaginatus Type II and III permits the penetration of irritants into the pulp tissue, if the imagination is deep, & cause inflammation, degenerative changes & pulpal necrosis. Most often teeth with dens invaginatus show altered crown morphology. However, involvement may be present without any clinical signs also. Radiographic examination in essential for conforming their presence. However periapical radiographs are not only limited in revealing the type, extension and complex morphology of dens invaginatus, but also the actual bone loss compared to tomographic techniques. Contribution of newer advancement techniques like CBCT has shown great benefit in the localization and identification of root canals and provides more details of this developmental anomaly.[27]

Once diagnosis is established, the proposed treatment methods are conventional endodontic therapy[28], surgical endodontic treatment[29], intentional replantation [30] or combination or extraction according to the individual cases. Endodontic therapy may present complications due to complex morphology of the root canal system with invagination. If no entrance to the invagination can be detected & there are no signs of pulp pathosis, then no treatment in required other than fissure sealing of the invagination. When the tooth has an immature root, apexification may be necessary.

In the present case, #45 was extracted as on the patients preference, #35 was treated endodontically. Since the maxillary incisors were totally asymptomatic, fissure sealing was done for Maxillay lateral insicors. The patient is being under regular follow up.

Conclusion

Dens invaginatus is clinically significant due to the possibility of pulpal involvement. So, clinicians should not fail to suspect the possibility of Dens invaginatus, when a tooth presents pulpitis without a history of trauma or caries.

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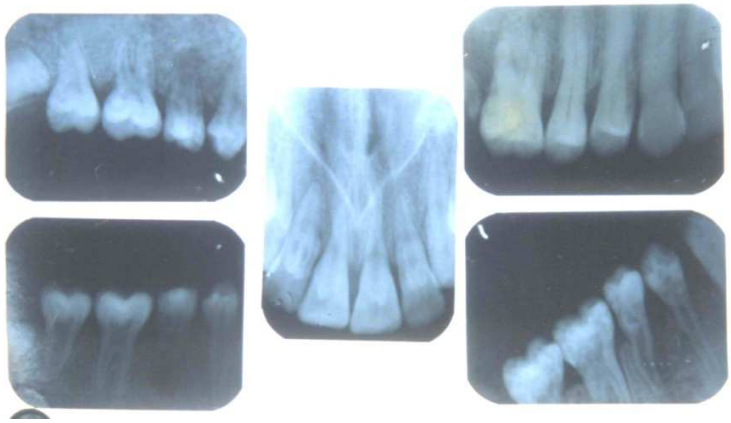
FIGURES AND LEGENDS

Figure1: IOPA showing Dens invaginatus in maxillary incisors and mandibular second premolars.



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WDC SECRETARY'S REPORT

Dear Colleagues,

It is the high time to write a few words of gratitude to all WDC members, IDA Kerala state and IDA national head office for their immense support and encouragement for all WDC activities.

IDA Kerala state award, National award and the ceremony of honouring in connection with. Dentist's day celebrations are previllages to the women dental surgeons of Kerala state.

IJWDC ; The international electronic journal of WDC Kerala State is the official and scientific project of WDC Kerala state 2013. The editor Dr.Jyothi.S.G. and the editorial board need congratulations for bringing out successfully.

IJWDC is the second of it's kind in IDA Kerala state. The world wide web of IDA Kerala state has a scientific page. IJWDC can be accesed from it. It can link doctors, teachers, professors, institutions, students, companies and so on.

Report of activities is summarized in photos. Right from the installation ceremony of WDC at Lulu International convention Centre, Thrissur (KSDC 2012) all the activities proved the spirit and energy of women dental professionals of IDA Kerala State.

Let this indomitable energy sprout throughout.

Jai Ho WDC & IDA

Thanking you,

Secretary

Dr.Mercy Joji

Installation of office bearers of WDC 2013 at Lulu International Convention Centre, Thrissur.

National award to WDC 2012 at IDC Kolkata.

WDC 2012 exhibition cum sale at 45th KSDC - Thrissur.

Poster release - 45th KSDC - Thrissur.

IDA state award to WDC 2012 at 45th KSDC - Thrissur.

Inauguration of WDC 2012 exhibition cum sale at 45th KSDC - Thrissur.

Annual general body meeting of WDC 2012 at Lulu International Convention Centre - Thrissur.

International women's day celebrations at Azeezia Dental College, Kollam.

ENERGISE 2013 on 5th May 2013 at Hotel Hill Park, Pathanamthitta.

Dr.Anitha Balan's Lecture on 8th March 2013 at Azeezia Dental College, Kollam.

Dr.Alfred Samuel's Lecture on 8th March 2013 at Azeezia Dental College, Kollam.

International Women's Day Celebrations Of WDC Malappuram Branch.

International Women's Day Celebrations Of WDC Attingal Branch.

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Discussions Emphasize the new & important aspects of the study and the conclusions that follow them. Do not repeat the observations to other relevant studies. Relate observations to other relevant studies & point out the implications of the findings & their limitations. Avoid unqualified statements & conclusions not completely supported by your data. Recommendations, when appropriate, may be included.

Acknowledgements Acknowledge only persons who have made significant contributions to the study. Authors are responsible for obtaining written permission from persons acknowledged by the name because readers may infer their endorsement of the data & conclusions.

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