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TRIVANDRUM DENTAL JOURNAL

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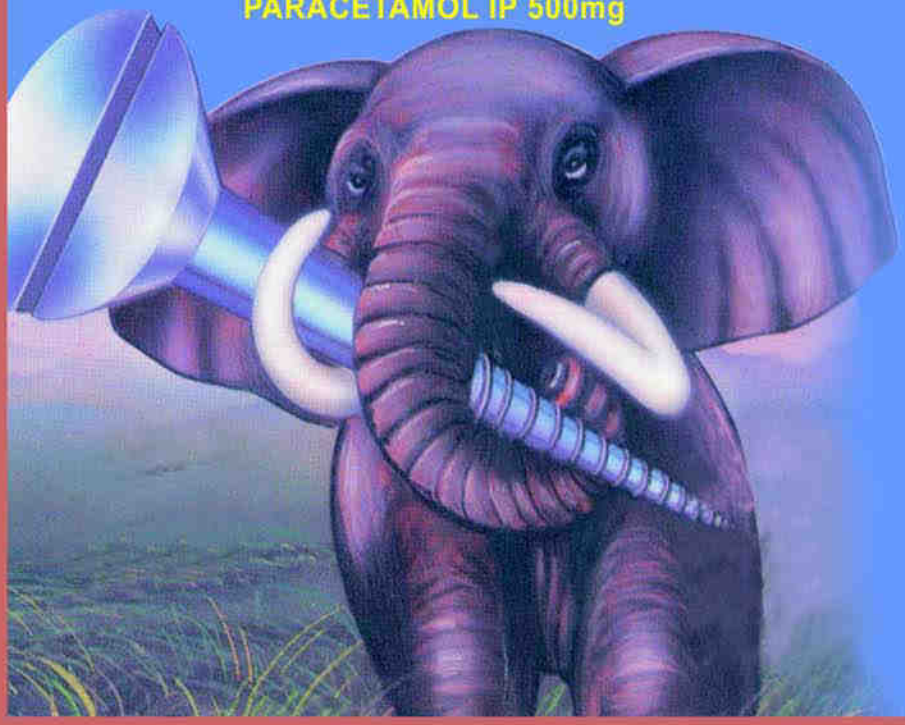

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Editorial

Oral cancer screening in routine dental practice : A social service measure

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Most oral diseases are preventable and the list includes oral cancer. Oral cancer is the 11th most common cancer in the world [1] . India alone accounts for one fifth of all oral cancer cases and one fourth of all oral cancer related deaths in the world; it is the most common cancer among men and the third common cancer among women [1,2]. Oral cancer can be detected early by very simple methods that includes routine mouth examination by a dental surgeon that takes not more than 120 seconds [2,3]. The paradox is that about 70 % of oral cancers are diagnosed in advanced stages with high mortality [4] . In addition to the painless lesions not being recognised by the patient , oral cancer is one disease that is often overlooked with respect to emphasis on prevention and early detection in clinical practice. Dental surgeons responsible for periodically, and thoroughly, examining the patient's face, neck and oral cavity for the presence of lesions and diseases can immensely contribute to the prevention and control of oral cancer,by devoting some time for routine oral cancer screening. Incidentally oral cancer happens to be a poor man's disease ,being more prevalent in the rural population. Unfortunately 80% of dentists work in major cities in India and very little oral health care services are provided in the rural areas where more than 70% Indians reside[5]. Therefore there is a need for extending the services of dental surgeons to rural areas without compromising on the diagnostic quality.

Keeping these in view the Regional cancer center ,Trivandrum, is coordinating an ambitious training program on "Prevention and control of oral cancer" along with National rural health mission[NRHM] and Indian dental association Kerala state. Faculty members of the program have been travelling to different locations in the state of Kerala for providing training in prevention, early detection, treatment and rehabilitation of oral cancer , for practicing dental surgeons. The idea is to motivate and create a large group of dedicated dental surgeons who can effectively incorporate systematic examination of oral cavity for oral cancer and pre cancer detection , prompt referral to treatment centers and initiating tobacco cessation activities , in their day to day dental practice. The program also envisages propagation of such awareness among other dental surgeons, by those who get themselves trained . The Indian dental association can play a very important role in percolating this awareness to the dental surgeons practicing in the rural areas as a social service measure since it is a proven fact that good prognosis of oral cancer depends largely on early detection.

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CASE REPORT

Intra oral adenoid cystic carcinoma: Report of three cases

Anuradha Pai[1], D. Sujatha[2], P. Shibu[3]

ABSTRACT: Adenoid cystic carcinoma (ACC) is a relatively rare epithelial tumor and comprises about 1% of all malignant tumor of the oral and maxillofacial region. ACC accounts for 4 - 8 % of all salivary gland tumors and 14 - 25 % of minor salivary gland tumors. It occurs relatively more often in the minor salivary glands of the hard palate. It usually occurs in the fifth decade of life, but may occur at any age from 20-80 years. ACC has a characteristic feature of slow growth, late onset of metastasis and poor prognosis. We are presenting 3 cases of ACC at different intraoral locations.

KEY WORDS– Adenoid cystic carcinoma, minor salivary glands, perineural invasion

Introduction

Adenoid cystic carcinoma (ACC) of the salivary glands was first described in 1856 by Billorth and at the time was referred to as cylindroma due to its unique histologic appearance.[1,6] Cylindroma was renamed as adenoid cystic carcinoma in 1928. Adenoid cystic carcinomas are uncommon tumors, comprising less than 1% of all head and neck cancers.[2] ACC accounts for 4-8% of all salivary gland tumors and 14- 25% of all minor salivary gland tumors.[3] There is no significant sex or racial predilection noticed, but some studies report a female predominance. Half of these tumors occur in glandular areas other than the major salivary glands, principally in the hard palate, but they also arise in the tongue and in other areas that are the site of minor salivary glands. Unusual locations include the external auditory canal, nasopharynx, lacrimal glands, breast, vulva, esophagus, cervix, and Cowper glands.[4]

Characteristic pathologic features of ACC are slow growth, perineural spread, local recurrence, and distant metastasis.[4,5] It may invade the skull base through the cranial nerves but seldom exhibits lymph node metastasis to the neck and head region. Microscopically, it is composed of basaloid cells with primarily myoepithelial/basal cell differentiation. Cribriform, tubular and solid are the three recognized morphologic patterns.[6] One of the important prognostic factors is the histological grade determined by the percentage of solid component in the tumor.[4] We present a case series of ACC of the minor salivary glands of the buccal mucosa and hard palate, and a literature review on its clinical, histo-pathological, therapeutic and prognostic aspects.

Case report - 1

A 40yr old female patient reported to our department with the chief complaint of a swelling on the lower right corner of the mouth since 7 years which has gradually increased to the present size. The swelling was associated with occasional sharp pain on digital pressure since 3-4 months. The patient also gave a history of chronic cheek bite on right side of the mouth.

On extraoral examination, a well defined solitary swelling was seen about 1cm below and distal to the right corner of the mouth. The swelling was approximately 2cm in diameter (Fig.1). On intraoral examination a well defined, solitary, oval swelling about 2cm in diameter was seen distal to the right

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commissure corresponding to the right lower canine and premolar (43,44 region). The overlying mucosa appeared normal, mild tenderness elicited on palpation, swelling was soft to firm in consistency and mobility of the swelling was limited (Fig. 2). There was no regional lymphadenopathy.

Fig.1 - Extra oral appearance of case 1

The patient subsequently underwent an incisional biopsy and sent for histopathological examination and the report confirmed the diagnosis of adenoid cystic carcinoma (Fig 3) of the minor salivary gland with perineural invasion. The patient was referred for surgery and radiotherapy.

Fig 2. Intra oral appearance of case 1

Case report - 2

A 60yr old male patient came to our department with the chief complaint of swelling on the palate since 2 years. Initially the swelling was small in size and gradually grown to the present size. Because of the increased size of the swelling the patient had difficulty in speaking and swallowing.

On intraoral examination a well defined, dome shaped, solitary swelling measuring approximately 5cm in diameter was seen on the right side of the palate. The swelling was extending antero posteriorly 1cm behind the incisive papilla upto the soft palate. Mucosa over the swelling was blanched in appearance. On palpation the swelling was firm to hard in consistency and mild tenderness also was present.

Incisional biopsy was done and sent for histopathological investigation and the report confirmed the diagnosis of adenoid cystic carcinoma of minor salivary gland. There was no evidence of perineural invasion. The patient was sent for surgical treatment and follow up.

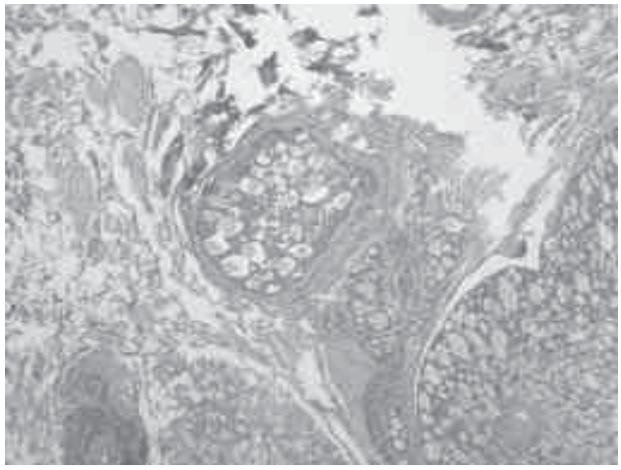

Fig 3 - Histopathologic picture of case 1

Case report - 3

A 40yr old female patient came to our department with the chief complaint of pain on the left lateral aspect of the nose since 7days. Eliciting the history a swelling was present on the left side of the palate since 5-6 yrs. It was smaller in size in the initial stage and gradually increased and burst 2 week back with tissue loss and blood discharge. It was followed by watery discharge through the left nostril.

On extraoral examination, there was a diffuse swelling on the left side of the face measuring about 2cm in diameter lateral to the ala of the nose. The overlying skin was normal in appearance. Mild tenderness was present on palpation. Intraorally there was a diffuse swelling on the left side of the palate extending from the mesial aspect of first premolar to the tuberosity region. The central area of the swelling was ulcerated and was covered with greyish yellow pseudomembrane without exudation. On palpation the surface appeared irregular and firm in consistency. The lesion was slightly tender also.

Incisional biopsy was done and sent for histopathological examination and the result confirmed the diagnosis of adenoid cystic

carcinoma of minor salivary gland without perineural invasion. The patient was sent for surgical management and follow up.

Discussion

Adenoid cystic carcinoma characteristically shows an indolent, but persistent and recurrent growth pattern, long clinical course and late onset of metastases.[1,6] In contrast to the other types of carcinomas, distant hematogeneous metastases are far more common than regional lymph node metastases. In 40–60% of cases distant metastases develop and are most common in the lung, bone, and soft tissues. The age of patients affected with major salivary gland tumors has been shown to be younger (mean 44 years) compared with the age of those who developed tumors of the minor glands (mean 54 years) with a female/male ratio of 1.6:1. Intraorally 50% of ACCs occur on the palate with other less common sites of involvement including the lower lip, retromolar-tonsillar pillar region, sublingual gland, buccal mucosa, and floor of mouth.

ACCs were classified according to their morphological growth pattern into three types: cribriform, tubular and solid. Cribriform and tubular ACCs were considered as low grade tumors, while solid ACCs as high grade tumors. The cribiform pattern has been described as "swiss cheese-like" and consists of pseudocystic spaces that either contain basophilic glycosaminoglycan or eosinophilic basal lamina material. The tubular pattern demonstrates more conspicuous ductal spaces and represents the most differentiated microscopic pattern of ACC. The solid pattern contains few or no cyst-like spaces and exhibits a greater degree of nuclear and cellular pleomorphism as well as mitotic activity when compared to the cribriform and tubular patterns. Diagnosis of ACC is usually rendered through incisional biopsy, but fine-needle aspiration biopsy (FNAB) is useful on diagnosis of ACC, especially in major salivary glands.[7]

Current management concepts favour combined treatment (surgery and radiotherapy) rather than supra-radicular surgery. Combination treatment with both surgery and radiotherapy has improved the control of local disease but not necessarily survival.[1,8] Radiotherapy is effective for the quality of life of the patients, even in those with inoperable, advanced tumours.[9] The reported response rates of salivary gland ACC to chemotherapy are varied, inconsistent and generally poor.[10]

In contrast to other epithelial malignancies with poor prognosis, ACC has a good 5-year survival rate.[6] However, overall survival continues to drop after the 5-year follow up period, producing considerably lower 10- and 20-year survival rates.[3,6] The main prognostic indicators are tumour site, stage, histological type, microscopic or gross disease at the surgical margin and perineural or perivascular invasion.[4] Minor salivary gland primaries have poor prognosis than their major salivary gland counterparts.[3] This is because of the smaller size and poor encapsulation of the minor salivary gland and surgical inaccessibility. Perineural invasion of a named nerve, positive surgical margins and tumours with solid pattern histology were associated with an increased rate of treatment failure.

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REVIEW

Corticosteroids in oral diseases

G.S. Asokan

ABSTRACT

When tissues are damaged by trauma or infection they become inflammed. In some conditions the inflammation is more damaging than the trauma itself or disease itself. Irrespective of the type of injury or insult the inflammatory response is suppressed by glucocorticoids. The action is non specific. wherein the cause of inflammatory reaction is not controlled by the Corticosteroids. Multiple mechanisms are involved in the suppression of inflammation by glucocorticoids. wherein the two basic effects includes blocking the early stages of inflammatory process and if inflammation has already begun it causes rapid resolution of the inflammation and increased rapidity of healing. Glucocorticostreroids are used extensively for their anti-inflammatory and immunosuppressive effects. This paper highlights the application of corticosteroids in various conditions and diseases affecting oral cavity.

KEY WORDS : Corticosteroids, Steroids, Oral diseases, inflammation

Introduction

A hormone is a chemical substance that is secreted into the body fluids by one cell or a group of cells and has a physiological effect on other cells of the body. Chemically hormones can be of 3 basic types namely Steroid hormones**,** derivatives of amino acid tyrosine and proteins or peptides. Different steroid hormones are secreted by adrenal cortex, ovaries, testes and placenta.

The two major types of adrenocortical hormones are the mineralocorticoids and the glucocorticoids secreted by the adrenal cortex. In addition to the naturally occurring compounds, several new steroids with glucocorticoids activity have been synthesized. Corticosteroids and their synthetic analogues are commonly used for their potent anti inflammatory and immunosuppressive property in the management of diverse conditions associated with chronic inflammation and immune phenomenon.

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However as a consequence of their pleiotropic effects, the clinical use of and withdrawal of corticosteroids are complicated by a number of serious side effects some of which are life threatening. Hence the decision to institute therapy with Corticosteroids always requires a careful consideration of the relative risks and benefits in each patient.

Physiological functions & pharmacological effects of glucorticosteroids.

The effects of Corticosteroids are numerous and widespread which include

1. Alteration in Carbohydrate, Protein and Lipid metabolism.
2. Maintenance of Fluid and electrolyte balance.
3. Preservation of normal function of the cardiovascular system, renal system, skeletal muscle, hematopoeisis, endocrine system and nervous system.

In addition by mechanisms that are still not fully understood. Corticosteroids help in resisting stressful circumstances such as noxious stimuli and environmental changes.

Some authors suggests that the anti inflammatory and immunosuppressive actions of Corticosteroids – the major pharmacological use

of this class of drugs provide a protective mechanism in the physiological settings.

Classification of steroids

I. Glucocorticoids

1. Short acting:
   a) Hydrocortisone
   b) Cortisone
2. Intermediate acting:
   a) Prednisone
   b) Prednisolone
   c) Methylprednisolone
   d) Triamcinolone
3. Long acting:
   a) Betamethasone
   b) Dexamethasone

II. Mineralocorticoids

1. Fludrocortisone
2. Deoxycorticosterone

Anti-inflammatory and immunosuppressive effects

When tissues are damaged by trauma or infection with bacteria they become inflamed. In some conditions the inflammation is more damaging than the trauma itself or disease itself**.** Irrespective of the type of injury or the insult the inflammatory response is suppressed by glucocorticoids. This is the basis of most of their clinical uses. The action is non-specific and the cause of inflammatory reaction is not controlled by the corticosteroids.

Multiple mechanisms are involved in the suppression of the inflammation by glucocorticoids. The two effects are :

l. It blocks the early stages of inflammatory process.

2. If inflammation has already begun it causes rapid resolution of the inflammation and increased rapidity of healing.

Applications of steroids in oral medicine:

Steroids in Oral Medicine are used in the management of multifarious conditions. The following are a few among the diverse applications of Steroids in Oral diseases.

1 .Lichen Planus
2. Oral Submucous fibrosis
3. Apthous Stomatitis
4. Pemphigus Vulgaris
5. Bell's Palsy
6. Mucocele
7. Erythema Multiforme
8. Ramsay Hunt syndrome
9. Temperomandibular Joint Pain and dysfunction
10. Chronic ulcerative stomatitis
11. Hemangioma
12. Meischer's Granulomatous cheilitis.

Lichen Planus

Oral Lichen Planus is a common chronic immunologic inflammatory mucocutaneous disorder[14]. Several studies were conducted with regard to the application of steroids in the management of Oral Lichen Planus.

In a study conducted by Zegarelli in 1983[1] – topical, injectable and systemic steroids were tried in 20 patients with one or more intraoral erosive or ulcerative lesions. Topical Kenolog in Orabase (Triamcinolone acetonide) was applied to the affected sites as a thin film, four times daily i.e., after every meal and before sleep for at least 3 weeks. Injectable – During the same period the lesions were injected with Methyl Prednisolone once a week for 1- 3 weeks as per severity of lesion and response of the tissues. Systemic Prednisone was administered systemically as 30 mg/day - 1st week; 15 mg/day – 2nd week; 5 mg/day – 3rd & 4th week. In the above study 7 patients received topical & injectable regimen, 5 followed topical & systemic and 8 received all three. And it was found that 5 of 7 who received topical & injectable showed complete improvement; 1 showed 75% improvement and 1 showed 25% improvement.[1.]

Oral Submucous fibrosis

It is a slowly progressive chronic fibrotic disease of the oral cavity and oropharynx, characterized by fibroelastic change and inflammation of the mucosa, leading to a progressive inability to open the mouth, swallow or **s**peak. Studies were conducted using steroids in the management of OSMF. In a study conducted by Gupta D, Sharma SC in 1988[2] - a new treatment

regimen using local injections consisting of a combination of Dexamethasone, Hyaluronidase and Chymotrypsin biweekly for 10 days was used. Good results were obtained in patients with severe limitation of opening and fibrotic bands with 74% had relief of painful ulceration, 100% relief of burning sensation, 79.5% blanching of oral mucosa and 94% relief of limited mouth opening[2].

Apthous Stomatitis

It is the most common recurrent oral mucosal ulcerative disease, yet it remains one of the least understood diseases of the oral cavity.[14] Studies were conducted to evaluate the effects of Steroids in Apthous stomatitis. In a study conducted by Muzio et al in 2001[3] the effects of topical Corticosteroid therapy in association with agents that increased the adhesion of the active drug to the oral mucosa in 30 RAS patients were studied.

The 1st group received 0.05% Clobetasol propionate, 2nd group applied the drug in an adhesive denture paste while the 3rd group applied the drug in an oral analgesic paste. Each patient was examined on the days when symptoms were present. They observed that the drug reduced the healing time in most patients and more significantly in the groups treated with adhesive denture paste. They concluded that the use of Clobetasol propionate in association with a denture adhesive had greater level of effectiveness as compared to the use of medication alone or with benzocaine containing orabase[3].

Pemphigus Vulgaris

It is a potentially life threatening disease that causes blisters and erosions of the skin and mucous membranes. Studies were conducted using steroids in the management of Pemphigus.

In a study conducted by Mignogna et al in 2000[4] – 16 patients with Pemphigus vulgaris with age between 26-76 were studied. All the patients complained of symptoms such as oral pain, dysphagia because of extensive mucosal erosion. The protocol for the initial / induction phase of treatment consisted of systemic Deflazacort (120 mg daily in a single morning dose) and topical corticosteroids. The initial dose of Deflazacort was maintained from 2-4 weeks especially in patients with severe disease. In addition in unresponsive cases patients received adjunctive systemic medication which included azathioprine (50-100 mg daily) or cyclophosphamide (50 mg daily). For Gingival lesions Clobetasol .05% in custom made applicator trays were used[4].

Bells Palsy

Most common form of facial paralysis is bells palsy, pathogenesis is unknown.

The role of steroids in Bell's palsy was studied by Mualichar et al[5]. They stated that if a patient is seen within 2-3 weeks of onset of symptoms, Prednisone in doses of 1 mg/kg/d for 10-14 days with gradual taper was recommended as long as there are no medical contraindications. The hope is that steroids might speed the recovery time and prevent synkinesis[5].

Mucocele

Mucocele is a clinical term that describes swelling caused by the accumulation of saliva at the site of a traumatized or obstructed minor salivary gland duct. Steroids have been tried in the management of Mucocele. In a study conducted by Wilcox et al in 1979[6], 14 cases of mucocele of lip were treated with steroids. A small syringe with a half inch 26 gauge needle was used to inject Triamcinolone acetate (0.5 to 1.5 ml). In 12 cases there was no recurrence for periods of observation of 16-24 months. It was concluded that the mechanism of action steroid is unclear; apparently the injected steroid either causes pressure atrophy of the feeding gland or resolution of the associated inflammation or both[6].

Erythema Multiforme

It is an acute inflammatory disease of the skin and mucous membranes that cause a variety of skin lesions. Steroids were used by Lozada in his study in the management of Erythema multiforme. In a group of 12 patients the synergestic effect of Prednisone and Azathioprine were studied. The minimum effective dose of Prednisone when used alone was 40 mg daily whereas with Azathioprine was never more than 25 mg daily and ranged as low as 5 mg daily. This study indicated that Azathioprine effectively reduced Corticosteroid requirement allowing lower

doses of Prednisone with satisfactory clinical efficacy and a marked reduction in side effects[7].

Ramsay Hunt Syndrome

It is a rare form of the disease characterized by Bell's palsy, unilateral vesicles of the ear and vesicles of the oral mucosa. Steroids were used in the management of Ramsay Hunt Syndrome by Sweeney et al in 2001[8] in his study along with Acyclovir. A 7-10 day course of Famciclovir (500 mg thrice daily) or Acyclovir (800 mg - 5 times daily) as well as Oral Prednisone (60 mg daily for 3-5 days) was used. It was found that they improved the outcome of recovery from Facial palsy[8].

Temperomandibular Joint Pain and Dysfunction

It is a complex disorder with suggested hypothesis being occlusal disharmony and psychological distress. Steroids have been tried in its management by Wenneberg B et al in 1991 who used a mixture of 0.5 ml betamethasone in a suspension of 6 mg per ml and equal volume of lidocaine chloride anhydrate (xylocaine 10 mg per ml) was injected into the superior compartment of the TMJ three times with an interval of 1 week between treatment. It was found that the subjective symptoms as well as the clinical signs were significantly reduced at the follow up after 8 years. Also the erosions of the bony articular margins of the TMJ were found to be remineralised[9].

Chronic Ulcerative Stomatitis

It is a recent entity which resembles Erosive Lichen Planus or Oral Discoid lupus erythematoses in its clinical and histological manifestations. The use of Steroids in its management was studied by Lorenzana et al was studied in 2000.Flucinonide .05% topical gel 4 times daily on the affected sites for 3 weeks and then Betamethasone dipropionate .05% 4 times daily for 2 months showed significant relief with less pain and in case of recurrences reinitiating of therapy[10].

Hemangioma

They are vascular lesions presenting as proliferations of vascular channels. They are tumor like Hamartomas and most oral Hemangiomas occur on the tongue. Steroids in its management were studied by Takato et al in 1993. An infant with a giant parotid hemangioma Prednisone 8 mg per day along with radiation 9 Mev daily to a total dose of 15 Gy for 16 days. Follow up at 8 years of age revealed resolution of the residual hemangioma without facial nerve dysfunction or facial bone asymmetry[11].

Meischer's Granulomatous Cheilitis

It is a rare disorder of unknown etiology which is characterized by non remissive enlargement of one or both lips with typical granulomatous findings on histological examination.

Hernandez et al in 1986 studied the use of steroids in its management. A 26 year old female patient who had a massive enlargement of the upper lip was treated with submucosal injections of 0.5 ml (3 mg/ml) of Betamethasone once a week followed by 2 injections every 4 months during a16 month period. The enlargement of the lip almost completely disappeared after 30 days of this treatment[12].

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REVIEW

Photodynamic therapy in periodontitis & peri-implantitis : A promising & a novel light therapy

Vinod Mony[1], Nita Syam[2], T. Siji Jacob[3]

ABSTRACT:

Photodynamic Therapy (PDT) technique uses long wave length visible light (red light) to activate photosensitizing agents (photo sensitizers) that produce reactive oxygen species, such as free radicals and singlet oxygen. These toxic oxygen derivatives then react with essential cellular components like DNA, proteins and lipids leading to cell death. Here we review current use of PDT in Periodontits and Peri-implantitis and look at its future potential as more selective photosensitising drugs become available.

KEYWORDS: Photodynamic Therapy, Photo sensitizer, Periodontitis.

Introduction

Microbial bio film in the oral cavity are involved in the etiology of various oral conditions including caries, periodontal and endodontic diseases, oral malodour, denture stomatitis, candidiasis and dental implant failures[1]. Periodontitis, a bio film associated inflammatory disease of periodontium, is a major cause of tooth loss in the world[2]. Dental plaque is the term commonly used for the bio film that is formed on the tooth surface and consists of a complex microbial community embedded in a matrix of polymers of bacterial and salivary orgin[3]. As microbial plaque have been proven to be the primary aetiological agent of inflammatory periodontal disease, the major purpose of periodontal therapy has been to eliminate all bacterial deposits on the tooth surface. Unfortunately the efficacy of debridement has varied in different clinical cases. The use of systemic antibiotics as an adjunct in the treatment of periodontal disease been necessary. However, the over use of antibiotics has been a major culprit in the production of drug resistant organisms. Therefore the application of an alternative method to eradicate bacteria from periodontal pockets is desirable. One such approach is Photodynamic Therapy[4].

Photodynamic Therapy

At the beginning of the last century, researchers found that microbes became susceptible to visible light mixed with a photosensitising compound. The use of photodynamic therapy for inactivating microorganisms was first demonstrated more than 100 years ago, when Oscar Raab reported the lethal effect of acridine hydrochloride and visible light on Paramecia caudatum. In 1904, Jodlbaner and Von Tappeiner coined the term photodynamic to describe oxygen dependent chemical reactions induced by photosensitization which can inactivate bacteria. In 1978, Daugherty et al successfully applied this novel technique for the treatment of different cancers. PDT, as a novel approach in medicine, was first approved by the US Food and Drug Administration (FDA) in 1999 to treat pre cancerous skin lesions of the face or scalp[5]. Recently, Allison et al described PDT as a therapy that "is truly the marriage of a drug and a light".[6]

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PDT has several advantages over surgery and radiotherapy. It is comparatively non invasive, it can be targeted accurately, repeated doses can be given with out the total dose limitations associated with radiotherapy and the healing process results in little or no scarring. PDT can usually be done in an out- patient or day –case setting, is convenient for the patient and has no side effects.

Mechanism of action

PDT involves three components: photo sensitizer, light and oxygen. When a photo sensitizer is irradiated with light of specific wavelength, it undergoes a transition from a low-energy ground state to an excited singlet state. Subsequently, the photo sensitizer may decay back to its ground state, with emission of fluorescence, or may undergo a transition to a higher-energy triplet state. The triplet state can react with endogenous oxygen to produce singlet oxygen and other radical species, causing a rapid and selective destruction of the target tissue. This utilization of oxygen in the production of reactive oxygen species is known as Photochemical oxygen consumption. The triplet-state photo sensitizer reacts with biomolecules by two mechanisms. The Type I reaction involves electron D hydrogen transfer directly from the photo sensitizer, producing ions or electron D hydrogen removal from a substance molecules to form free radicals. These radicals react rapidly with oxygen resulting in the production of highly reactive oxygen species (superoxide, hydroxyl radicals, hydrogen peroxide). The Type II reaction produces electronically excited and singlet oxygen. These two reactions indicate the mechanisms of tissue D cell damage which is dependent on both oxygen tension and photo sensitizer concentration[7]. PDT produces cytotoxic effects on subcellular organelles and molecules. Its effects are targeted on mitochondria, lysosomes, cell membranes and nuclei of tumor cells. Photo sensitizer induces apoptosis in mitochondria and necrosis in lysosomes and cell membranes[8].

Photo Sensitizers

PDT uses several photoactive components. An ideal photo sensitizer should be non-toxic and activated upon illumination. In general, the optimal photo sensitizer should have a number of photo-physical, chemical and biological characteristics, which includes the following[7].

1. Highly selective.
2. Low toxicity and fast elimination from skin and epithelium.
3 Absorption peaks in the low-loss transmission window of biological tissues.
4 Optimum ratio of the fluorescence quantum yield to the interconversion quantum yield.
5 High quantum yield of singlet oxygen production in vivo.
6 High solubility in water, injection solutions and blood substitutes.
7 Storage and application light stability.

In addition, for treatment of periodontal infections, the photo sensitizer should bind with bacteria and plaque without causing any cosmetic issues, such as unwanted staining of gingival tissues as well as other soft tissues.

Furthermore, it should be acceptable to patients and should easily access pathogens present in deeper periodontal pockets.

Types of photo sensitizers

Chemically, many photo sensitizers belong to dyes and porphyrin-chlorine groups. A variety of photo sensitizers [9] include:

1. Dyes: tricyclic dyes with different meso-atoms – methylene blue, toludine blue O and acridine orange; and phthalocyanines – aluminium disulphonated phthalocyanine and cationic Zn(II)- phthalocyanine
2. Chlorines: chlorine e6, stannous (IV) chlorine e6, chlorine e6-2.5 N-methyl-d-glucamine (BLC1010), polylysine and polyethylenei mine conjugates of chlorine e6
3. Porphyrines: haematoporphyrin HCl, photofrin and 5-aminolevulinic acid (ALA), benzoporphyrin derivative (BPD)
4. Xanthenes: erythrosine
5. Monoterpene: azulene.

Light Source

A laser or visible light source is used to activate the photo sensitizer. Early laser systems were complex and expensive. Subsequently, diode laser systems that were easy to handle, portable and cost-effective were developed. More recently, non-laser light sources are used, such as light-emitting diodes (LED) that are less expensive, small, lightweight and highly flexible.

Photo sensitizers can also be activated by low power visible light at a specific wavelength. Human tissues transmit red light efficiently at wavelengths of 630 nm and 700 nm and these correspond to light penetration depths from 5 mm to 15 mm respectively[10,11,12]. The use of a visible light source is beneficial in visualizing the target area, localization of the photo inactivation without damaging host tissue and presenting little damage to the operator[13]. Activation of the photo sensitizer is dependent on the total light dose, the dose rates, the depth of light penetration and the localization of target area.

Sources of light delivery vary depending on the location and morphology of the lesion. The light should be uniform and should deliver precise calculation of the delivered dose. Fibre-optic catheters with terminal cylindrical diffusers or lenses are often used. The tip of the fibre can be formed into various shapes allowing for diffusion in all directions or for focus. Currently, the use of fibre optics is very expensive and not FDA approved. Only diffusing fibres (1–5 cm) are commercially available[14]. Modern fibre-optic systems and different types of endoscopes can deliver light more accurately to the target lesion. Custom-sized and custom-shaped fibres are needed to achieve more homogenous illumination[15,16]. Overall, the light must penetrate as far as possible into the tissues and it should not produce any thermal effects.

Photodynamic therapy in periodontitis and peri-implantitis

An effective approach of periodontal therapy is to change the local environment to suppress the growth of periodontal pathogens. Micro-organisms in gelatinous matrix (glycocalyx) are less accessible to antibiotics. PDT is even effective against antibiotic resistant bacteria[17]. Antioxidant enzymes produced by bacteria may protect against some oxygen radicals, but not against singlet oxygen[18]. Photodynamic antimicrobial chemotherapy could be an ideal complement to conventional scaling and root planing. It employs a quick and simple protocol that allows the clinician to kill bacteria, inactivate virulence factors left behind after scaling and root planing. It is used during initial and maintenance therapy for the treatment of periodontitis.

During inflammation there is venous stagnation and reduced oxygen consumption by tissues. This decrease in oxygen level and change in pH may enhance the growth of anaerobic species. In such cases, PDT may improve tissue blood flow in the microcirculatory system and reduce venous congestion in gingival tissues. Furthermore, PDT may increase oxygenation of gingival tissues by 21–47 per cent. This in turn decreases the time and speed of oxygen delivery and utilization, thus normalizing oxygen metabolism in periodontal tissues[19].

Based on the advantages and characteristics of antimicrobial photodynamic therapy, it has been proposed that periodontal and peri-implant diseases are potential targets of this novel antimicrobial photochemotherapy. The photo sensitizer is placed directly in the periodontal and peri-implant pocket and the liquid agent can easily access the whole root or implant surface before activation by the laser light through placement of the optical fibre directly in to the pocket (Fig. 1)[20].

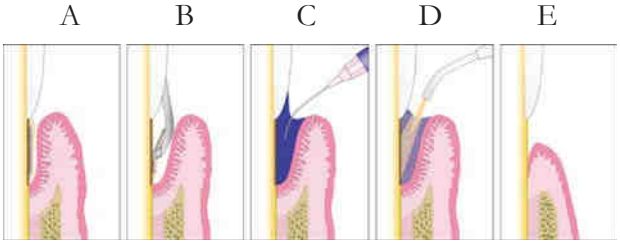

Fig-1. Diagram showing the steps of application of antimicrobial photodynamic therapy in the treatment of periodontitis. (A) Periodontally diseased site before treatment. (B) Mechanical debridement using hand curettes. (C) Application of the photo sensitizer via syringe at the diseased site that contains residual bacteria. Occasionally excess dye solution is removed using water spray. (D)

Photosensitization is performed using an intensive light by a special tip applied in the pocket. Singlet oxygen and other very reactive agents that are toxic to bacteria are produced, resulting in photochemical disinfection of the periodontal pocket. (E) Improved wound healing in the treated site.

As a result of the technical simplicity of the method and the high effectiveness of bacterial killing, the application of antimicrobial photodynamic therapy in the treatment of periodontal and peri-implant diseases has become a successful treatment modality.

Conclusion

Antimicrobial photodynamic therapy seems to be an alternative option as a low cost treatment approach in the field of Periodontics and implant dentistry. This therapy may hold promise as a substitute for currently available chemotherapy in the treatment of periodontal and peri-implant diseases. At this time in history , it is difficult to know where light will lead us in the oral cavity but the promise is clear and the oppurtunities are visible.

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REVIEW

Trends in the preparation of laminate veneers

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ABSTRACT:
Laminate veneer is the modern trend in smile designing. This article provides information regarding the various steps involved in the tooth preparation of laminate veneers.

KEY WORDS: Laminate veneers, Dental veneers

Introduction

A desire to look attractive is no longer taken as a sign of vanity. In an economically, socially and sexually competitive world a pleasing appearance is a necessity. And hence sound dentition is an asset to one's personality. A beautiful smile can create wonders. While pleasing and attractive to the observer, it also enriches the one who smiles.

The dentists have a responsibility to produce harmonious smile without affecting the function of the oro-facial complex. Needless to say any procedure for the same should be as conservative as possible.The key to successful treatment lies in the harmony of the oral region of the face and teeth. The veneers are the recent trend in this direction.

History of Laminate Veneers

Smile has been evidenced as early as 300 BC. A smile on the face of statue of King of Arab is noted in the act of Summer. The dento-labial smile, where teeth are seen behind the lips started to emerge in the first decade of the 20th century. From that time on teeth began to play an important role in the face both in statues and portraits. The resulting emphasis on dental esthetics resulted in the emergence of laminate veneers.

Laminate veneers were fabricated as early as 1930's by Pincus. He used the 'used air fired' porcelain for the same. By 1955 Bunocore's research into acid etching and the introduction of Bowen's resin Bis- GMA in the year 1960 resulted in the usage of composite as a veneering material. It had the drawback of reduced working time, lack of wear resistance and delamination. In 1975 with the advent of etching porcelain by Rochette, porcelain became the material of choice for laminate veneers.

Veneer Preparation

Tooth preparation for veneer fabrication involves two stages-

A. Shade selection
B. Tooth preparation

A. Shade selection

Shade selection is an important step in veneer preparation. Correct shade selection is vital to the success of the veneer. Shade selection is to be done prior to the preparation of the veneers. The various factors which affect the shade selection are as follows:-

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1. Lighting of the operators room Colour corrected light and natural daylight are preferred to other sources of light in shade selection.
2. Shade selection should not be done on dried tooth since the tooth appears whiter when dried. Isolation with cotton rolls and rubber dam also should be avoided while shade selection.
3. Colour acuity and colour fatigue resulting from staring at an object for long duration results in wrong interpretation of colour.
4. Stains and plaque on surface of tooth should be removed prior to shade selection.

B. Tooth preparation

Cardinal rules for preparation:

1. The preparation should be as conservative as possible.
2. The preparation should allow for covering of 0.3mm to 0.5mm of veneer material without giving the tooth an overly thick appearance.
3. The preparation should not penetrate the dentin.
4. The preparation should allow for cleansable gingival margin.
5. The preparation should not include sharp angles.
6. The preparation should have a path of insertion which is free from undercuts.
7. Adequate clearance should be present inter-proximally.
8. Definite finish line should be prepared for accurate placement.

The principles which enhance tooth preparation are of three types.

1. Tooth surface :- Graded tooth preparation rests on the principle that more the colour change greater the amount of tooth reduction. Two levels of graded tooth preparation are necessary to create space- one level for moderate colour change and another for profound colour change.

2. Resin interface space :- Resin interface space allows the resin to dilute the tooth discolourations. So greater the discolouration greater should be the resin interface space.

3. Veneer formulation :- The brand of porcelain to be used depends on the degree of discolouration. In general, for a two shade colour change or less the porcelain of choice tends to be relatively translucent whereas for masking discolouration more opaque porcelain with characterization should be used.

Rationale for enamel preparation

Enamel preparation is performed for the following reasons:-

- To provide for adequate space for porcelain material
- To remove convexities and provide for single path of insertion
- To provide space for adequate opaquing/luting agent
- To provide a definite seat for the laminate
- To prepare a receptive enamel surface for etching and bonding the laminate
- To facilitate sulcular margin placement in severely discoloured teeth

The criteria of tooth preparation depend on the case. The present concept of enamel reduction varies from no reduction to minimal reduction. The 'no prep' (lumineers) concept which became popular in 2010 became successful in cases with teeth having normal anatomy, proper alignment and no discolouration. This need not be the same in a tetracycline stained teeth were enamel reduction is mandatory to bring about the desired effect.

The concept of superfine laminates 0f 2010-11 is also gaining popularity. This reduces the amount of enamel preparation drastically.

Enamel reduction procedure

1. Labial reduction

As far as possible the preparation should be limited to the enamel. This is because of three reasons – firstly, dentin bonding provides only a fraction of the bond strength possible. Secondly, it is more conservative than when compared to dentin preparation. Thirdly, dentin exposure can be problematic during acid etching and bonding resulting in pulpal hyperemia and necrosis. In addition restriction of the preparation to the enamel ensures enhanced seal.

As in ordinary crown preparation laminate preparation also uses depth guides. One of the most effective depth guides is LVS depth cutter diamond by the Brassler Savannah Company. This diamond stone will causes horizontal striations or depth –cut grooves on the labial aspect of the tooth leaving raised strips of enamel in between. The depth of the bur is limited by the shank which comes to rest on the surface of the uncut enamel between the striations. The depth cutting diamond comes in two sizes – LVS no I and LVS no 2. LVS 1 has a dimension of 0.5 mm and is used for reduction in most of the situations. LVS 2 has a dimension of 0.3mm and is used for small teeth such as mandibular incisors. The raised enamel is removed to the depth of the original groove.

An alternative method of gauging enamel reduction is to use a No.1 round bur. The depth of this bur from periphery to shank is 0.4mm. The bur is held at a slight angle, so that indentations can be made into the enamel. This ensures uniform reduction on labial aspect of the tooth. However the problem with this type of reduction is that depth cuts can differ depending on how thebur is held.

The remaining enamel must be reduced to the depth cut or striations by two ways. 1) Bulk reduction with the aid of coarse diamond. This facilitates added retention and refraction of light. 2)Marginal reductionwith the aid of fine-grit diamond. This will create a definite, smooth finish line with better peripheral seal.

The remaining enamel can be ideally reduced with the help of the unique 'LVS two-grit diamond'. The LVS two-grit diamond concept is based on the idea that coarse reduction on axial wall andfine reduction on periphery can be achieved in a single go with a single bur. The LVS two-grit diamond removes the coronal enamel with a coarse grit and desired finish line with fine diamond. The diamond is drawn across the labial surface from mesial to distal direction; following the curvature of the gingiva from the top of the mesial interproximal papillae down to the most apical extend of the free gingival margin and back up to the tip of the distal interproximal papillae.

2. Interproximal reduction

The margin of the veneer should be hidden within the embrasure area. It is best to extend the veneer beyond the mesiobuccal and distobuccal line angle to ensure wrap around effect.

This is achieved with LVS two-grit diamond moving the margin to the embrasure area, just lingual to buccal surface of interproximal papillae. The advantage of this is that the margins are not visible from lateral oblique view or directly from the front.

The extend of inter proximal reduction predicts which type of porcelain laminate fabrication technique to be used. If platinum foil matrix system is used, as opposed to the refractory die technique, work on individual dies will be necessary. This process will require the modification of contact point prior to impression making by passing a very fine, one-sided diamond abrasive strip 20-60μm size through the adjacent teeth. The abrasive side will reshape the contact area rather than separate them.This facilitates snapping a part of the model into dies.

3. Sulcular extension and marginal placement

Sulcular extension and marginal placement are carried out with the LVS two-grit diamond bur. Place a narrow gingival displacement cord in the sulcus for about 8-10minutes to slightly displace the tissues. This facilitates a) access for diamond 2) less gingival trauma and 3) direct vision of the margin during all procedures. The fine diamond at the tip of LVS two grit diamond cuts slowly through the sulcus thus reducing the risk of over preparation. The diamond merely refines and defines the finish line, in doing so it moves the finish line from gingival margin to 0.2mm or less into the sulcus.

4. Finishline Configuration

Stained teeth especially by tetracycline necessitate the placement of finish line further subgingivally. In addition there should be a continuation of emergence profile so that there is no ledge at the junction of the veneer and enamel to act as depository area for plaque. The laminate fabrication technique requires a cervical reduction of a minimum of 0.25mm.

A feather or knife edge finish line is the most conservative finish line configuration. But sparingly used due to the following reasons:

- The difficulty in fabricating the veneer to the required degree of thinness
- The inevitable increased thickness subgingivally and resultant potential for gingival problems.
- The laboratory problems in delineating the exact end of preparation.

The most desired form of finish line is the 'modified chamfer' as created LVS two grit diamond or one with similar shape. The modified chamfer is of nominal depth (0.25mm) near the cement-enamel junction where the thickness of the enamel decreases rapidly. The preparation of chamfer in the cervical area also aids in sealing the restoration by removing the acid resistant surface enamel and exposing the subsurface enamel which is more readily etched.

5. Incisal or occlusal reduction

The fabrication of the veneer lapping the incisal edgemakes placement of the restoration easier by virtue of having provided a definite stop during seating. There are four incisal edge reduction patterns. They are as follows:-

a. Window :- Veneer is taken close but not up to the incisal edge. In other words incisal edge is not tampered.

b. Feather :- Here the veneer is taken up to the incisal edge, but is not reduced.

c. Bevel :- In this case buccopalatal bevel is prepared across the full width of the preparation. This preparation necessitates reduction of incisal length of the tooth.

d. Incisal overlap:- In this design not only incisal edge is reduced, but also the palatal aspect.

Out of the four designs, window preparation is considered the strongest and overlaps design the worst. However incisal reduction should be limited between 0.5-0.75mm.

6. Lingual reduction

Any reduction of the incisal edge necessitates some lingual enamel modification so that there is no butt joint at the incisal/ lingual junction. A rounded chamfer is the ideal choice in this situation. This modification will help to prevent the veneer from shearing away at the incisal edge during function. Lingual reduction provides increased strength and better bonding of the veneer.The increase thickness of the veneer due to lingual reduction enhances incisal guidance.

Conclusion

Laminate veneers are the modern trend in Esthetic Dentistry. It can help us to design smile conservatively. The different concepts in the principles of tooth preparation give the operator a better idea in managing the prosthesis. Needless to say it must be based on sound dental practice and total dental health.

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REVIEW

Intra oral digital radiography - An over view

Ajmal M

ABSTRACT:

Digital Radiography has become a developing branch in dentistry. Radiographs are taken without the use of conventional film, so the name filmless radiography. The sensor used here is an electronic device. Image storage, image manipulation and teleradiography are few of the advantages of this system. This paper is intended to give an overview on digital radiography and its application in dentistry.

KEY WORDS: digital radiograph, X ray

Introduction

Digital Radiography is one of the recent developments in Dental Radiology. As the world surges ahead with computer applications the field of Digital Radiography takes top position among diagnostic medicine. Digitalization takes the radiology into the land of electronic manuscripts. Taking radiographs, sending it through Internet to a distant locality, evaluating expert's interpretation, demise of darkroom etc., the advantages of digital radiography are really amazing.

The term digitalization means conversion of data into binary numbers using a computer. The digital dental radiology came into existence when Trophy Company in 1989 introduced RVG, the first digital radiographic system[6]. The term RVG [radiovisiography] is a brand name. It needs a radiographic source, a visual part-the computer monitor and the Image printout- the hardcopy. An electrostatic device replaces the conventional film, which is sensitive to X- rays. The latent image formed in this device is send to a digitizer, which converts it into visual analogue. Currently there are about more than 20 companies manufacturing digital dental radiographic systems (Chart 1). Digital radiography has got intraoral, panoramic as well as extra-oral versions.

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What is 'Digital'?

The term digital means data are converted into binary numbers using a computer or such devices. An analogue image is traditionally described as being like a painting in which colours blend smoothly with one another, with no smaller part making up the image. Eg: television image, radiograph, photograph etc. Whereas in Digital, it is like a mosaic, made up of many small pieces put together to make a whole. Imagine if we took a painting and put a grid on top of it (Figure- 1). For every square in the grid we would record two numbers. The first number is its location and the second is its brightness value. These numbers are recorded in square of 2 patterns. This process is called as digitalization. The grid used is referred to as the image matrix, and each individual square in the matrix is known as a pixel. The more pixels that are present in an image the greater the resolution of the image is. Resolution also depends on the pixel size. More the number of pixels in the sensor more will be the resolution. In order to incorporate more pixels in the sensor, pixel sizes are reduced. Modern sensors have pixel size as small as 25 m, and resolution up to 20 line pair per mm for intra oral sensor.

Types of Digital Radiography:

Digital system can be classified into Direct and Semi-direct and Indirect digital radiography[5]. Direct Digital Radiography [DDR] also known as Real time imaging, means the image

is instantly displayed to computer after the sensor is exposed to X rays. It uses CCD (charge couple device) or CMOS (Complimentary metal oxide semi conductor) as sensor, which is connected to the computer through a cable. In Semi-direct Digital Radiography, the detector is devoid of cable and the image is formed on the computer when the sensor is scanned by a drum scanner. Here the detector is PSP (Photo Stimulable Phosphor Image plate). The routine film radiograph also can be digitized by using flatbed transparency scanner, which is known as Indirect digital radiography.

The sensors available are of the same sizes as of Films, ie. Sizes 0, 1 and 2. Size 0 is mainly used for children, size 1 for anteriors and size 2 for posterior teeth. Size 1 is also known as universal size sensor. Even some companies have sensors of occlusal film size (size 4), used for occlusal radiography. Sensor holding devices are also available for both long cone and short cone intra oral radiographic techniques

Fig. 1 showing digitisation process

Chart 1:

Lists of few Intraoral Digital Radiographic Systems:

COMPANY	PRODUCT NAME	SENSOR
Schick*	CDR	CCD
Orex*	CD-Dent	PSP
Cygnus Technologies	Cygnus Ray MPS [Panasonic]	CCD
Gendex*	DenOpticsVisualix	PSPCCD
J-Morita	Dixel	CCD
MedizinRechner	DEXIS	CCD
Soredex*	Digora fmx	PSP
Planmeca Group*	DixiMultiscan	CCDPSP
Villa Sistemi Medicali	Dixsy (Flashdent)	CCD
Fimet	F1iOX megapixel X-ray Sensor	CCD
Dental/Medical Diagnostic Systems Inc.	MPDx	CCD
Sirona*	SIDEXIS	CCD
Instrumentarium imaging*	SIGMA	CCD
Kodak*	RVG 6500/6100	CCD,CMOS
Dent-x	Sens-A-Ray 2000	CCD
Dürr Dental	VistaRay	CCD

* Companies have Digital Panoramic & Cephalometric units.

CCD = Charge Couple Device.
PSP = PhotoStimulable Phosphor plate

Working Principle:

Digital Radiography unit has three components; Detector, Computer (the digitizer part), and the Image printout.

Detector (sensor): In direct digital, the detector used is charge couple device [CCD] or CMOS [complimentary metal oxide semiconductor].CCD is an X-ray / light sensitive array of semi conductors on a silicon chip [Fig. 2]. Charge- Coupling is simply a process by which accumulated light or X ray photons are transferred at the atomic level from one electron well to the next in a sequential manner and finally to a read-out amplifier[3]. Since CCD sensors cannot store information, a wire connecting the sensor to the computer is required.

CCD is essentially a miniature video camera sensitive to light. Thus, within the image detector the X- ray photons are converted to light, by an intensifying or scintillation screen, which is picked by the CCD, relayed to the computer and converted again into digital data and hence into a gray scale visual image which is displayed almost instantly on the monitor.

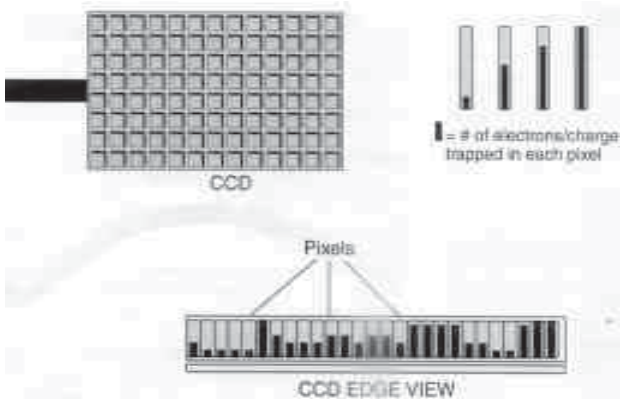

Fig: 2. Digital Radiography using CCD sensor

CMOS/APS: Complementary metal oxide semiconductor is a type of integrated circuit like CCD. Here pixels sizes are smaller than CCD and less power requirement and less price compared to

CCD. But drawback was noisy image. This is overcome by use of APS technology with CMOS system. APS means active amplifying transistor, is incorporated within the pixel. This sensor need not require any circuit board inside the computer as used for CCD. In most advanced system CMOS/ APS is used.

Photostimulable phosphor image plate is the detector in Semi-direct digital radiography[4]. Storage phosphor imaging plates are very much like the lanex screens we all use for our extraoral imaging. In the case of lanex, X- rays strike the screen and the screen instantly converts the X- ray energy into light photons. The light then exposes the film. The X- ray energy is captured but the light is not released from the imaging plate until the plate is stimulated with a laser beam [Fig. 3]. When it is exposed to laser beam the X-ray energy stored in the crystals are emitted as fluorescent optical signals, which then converted to time serial electric signals. The scanner stimulates the imaging plate one dot at a time and stores a record of the number of photons detected. The digital image is made up of thousands of such dots.

The data from the sensor is transmitted to a special board in the computer, called a frame grabber, the function of this board is to sample the signal at short intervals thus converting the analog signal into digital signal. When the image is captured and digitized by means of an electric sensor system, the radiation intensities are measured along a rectangular 2 dimensional grid of sensor element, called pixels. The output of the measurements is stored in the computer as numbers. These numbers have discrete values; only integer values are possible. Usually the range of numbers is from 0 to 255 in digital imaging. Completely black is represented by 0, and white is 255. The other shades of gray have values between 0 and 255[4].

The Image: The image thus formed on the computer monitor is called as digital image. It can be subjected to image manipulation. The image can be changed in brightness, contrast, sharpness, resolution and in density. It can be revert to positive and negative or even in colourised mode. Measurements of the various parts of the image are possible in various aspects like Linear, angle measurements as well as measurements in multiple

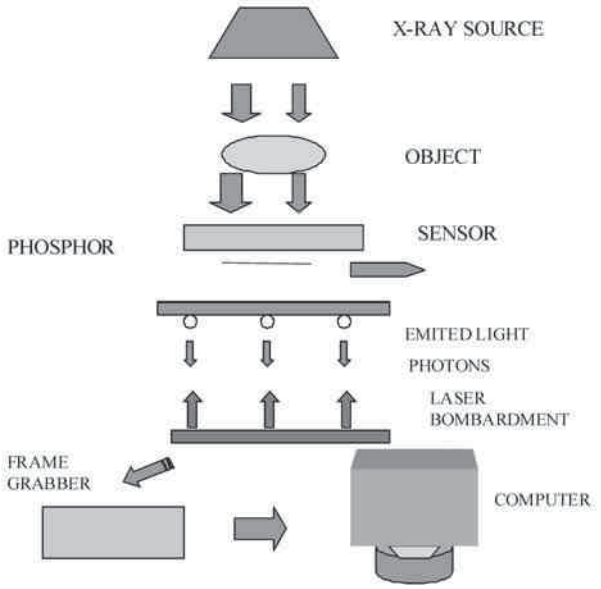

Fig: 3. Digital Radiography using PSP sensor

lines. Superimposition of two images is another function; here one image is made positive and other one negative, used in Digital subtraction Radiography. Zooming of the different areas and flash lightening the image is an added advantage. It can be stored in a computer hard disc for a long time. Single IOPA image size can be ranging from 300 to 1000 Kilobyte.

Hardcopy: The printout can be taken with Photothermal printer, Laser printer, Inkjet printer and Dry camera(Laser film printer). Thermal printer gives the best quality when compared to other types of paper printouts. Whereas digital film print is possible with dry camera, and it will have advantage of view box viewing. Various notes can be added onto the printout. Preoperative and Postoperative visualization of the region enables a good comparison.

Computer requirements:

Any basic computer having at least Celeron processor with minimum 256 MB ram is sufficient, but with fast processor with graphics card and high ram makes the digital X-ray software very fast. All these systems don't require any special internal circuitry board inside the computer. Increased hard disc space is needed for large amount of image storage.

Maintenance of Digital radiography system.

Practitioner should be very careful in handling the sensor, especially of CCD type. CCD

sensors are highly fragile and sensitive ones. When not in use this sensor should be kept in the sensor tray provided by the company, which can be fixed to the Dental chair handle. While in use it is used exactly like how a film is kept in the oral cavity. It should be kept inside a plastic paper so that infection control is taken care. Sensor can be supported by holding device or by patient finger like in Film. Sensor can be cleaned with spirit using cotton. The X – ray room floor should be well carpeted so that in case sensor falls down also, damage can be avoided. There should not be any sharp corners or edges in the room.The sensor cable can be tied to the chair handle to avoid falling down. And too much of bends or sharp bend of the cable should not be made; it may spoil the cable system. The life expectancy is still unpredicted, but in our university it is being used for the past 3 years with daily x-ray exposures of nearly 50 patients without any problems.

Advantages of Digital Radiography:

- Reduction in Radiation dose: It is the major advantage with these systems. Radiation is reduced upto 75%. It means that radiation dose needed for taking one conventional radiographic image is four times greater than taking one digital image.
- Instant display of Image: Image is displayed to the computer monitor within seconds after the radiographic technique.
- No dark room: Darkroom is eliminated, no need of developing and fixing.
- PSP sensors are flexible and thin.
- Image manipulation: It can be manipulated in various ways as shown before.
- Image reconstruction: used to make 3 dimensional information.
- Image storage: It can be stored for a long time without any change. It can be stored in a computer hard disc or in any storage devices.
- Artificial Intelligence: Some software has the capability of detecting lesions like dental caries.
- Digital Subtraction Radiography: Superimposition of two images after one is made positive and other in negative mode.
- Some systems even work in Wi-Fi mode. Here computer can be placed at a distance of 50meters from the sensor/X-ray machines.
- Teleradiography: Image can be send to a different site through computer network. It enables in obtaining expert opinion.

Drawbacks of Digital Radiographic System:

- Facilities not widely available: Because it is a very expensive.
- Positional difficulties: the sensor is bulkier (in case of direct digital) hence difficult to keep inside the mouth. CCD sensor has got a cable attachment from the sensor so uneasiness for the patient compared to PSP sensor.
- Autoclaving of the sensor is not possible. Plastic covers are used for infection control, chemical methods are also followed.
- Easy fragility: Damage can occur easily if it falls down. So operator should be very careful in handling the sensor.
- Image Quality: compared to conventional film image it is not superior. In newer generation image quality is as good as that of a conventional fast film image.

Research works done:

Sanderink et al (1994)[10] showed that the diagnostic accuracy of direct digital radiography is inferior to film images, when size 10 files were used for rootcanal length detection. He used four digital systems in his study. E Borh and Grodahl (1995)[12] found that storage phosphor system rendered higher image quality than film or CCD system. Kullendrof et al (1996)[8] showed quality of the direct digital images are comparable to that of E speed film in detection of periapical bone lesions. H.Vissar and Kruper (1997)[11] suggested that image manipulation can alter the diagnostic content of a radiograph and are unlikely to be detected by dentists and digital radiography requires additional measures for data protection. C Price and Ergul (1997)[9] showed that conventional film was superior to digital radigpraphy in interpretation of proximal caries.G. Kaeppler et al (2000)[7] demonstrated that accuracy of linear measurement using PSP sensor is superior to conventional film radiography. And the visibility of dental structures was equally good as that of

conventional film image. Recent studieshave shown that digital dental radiography systems are almost equal in diagnostic accuracy compared to film image[13]. A G Farmen (2000)[1] written an editorial in Dentomaxillofacial Radiology journal on standards for intraoral radiographic imaging.

Conclusion:

Digital dental Radiography is a promising technology, opening the door to new diagnostic procedures not available with traditional film based imaging.

Tomorrow's dentistry will use only the digital data, not the film image. We can see patients carrying storage devices with their radiographs in it. The dental clinics and colleges would be connected with computer network. Patients don't have to come for receiving the image. So the excact digital millennium.

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REVIEW

Revascularisation : A paradigm shift in management of non-vital teeth

Sandhya K.P[1], Rajesh Pillai[2], N.O.Varghese[3], S. U-nu[4]

ABSTRACT:

Regeneration of tissues rather than replacement with artificial substitutes is an emerging and exciting field in the health sciences. Revascularization of infected, nonvital, immature teeth has been documented to stimulate regeneration of apical tissues and to induce apexogenesis. Revascularization protocols are derived from the observations of reimplanted and auto transplanted teeth in experimental animals in which necrotic pulp, if free of infection, provided a matrix into which the cells from the periapical tissues could grow and re-establish pulp vascularity, slowly replacing the necrotic tissue. This article reviews mechanisms, treatment protocol and advantages of revascularization over current treatment modalities.

KEY WORDS: Laminate veneers, Dental veneers

Introduction: Regenerative endodontic procedures can be defined as biologically based procedures designed to replace damaged structures, including dentin and root structures as well as cells of pulp dentin complex. Presently two concepts exist in regenerative endodontics to treat nonvital infected teeth-one is active pursuit of pulp dentin regeneration to implant or regrow pulp (tissue engineering) and the second in which new living tissue is expected to form the tissue present in the teeth itself, allowing continued root development (revascularization)

What is revascularization?

Revascularization is the procedure to re-establish the vitality in a nonvital tooth to allow repair and regeneration of tissues. The rationale of revascularization is that if a sterile tissue matrix is provided in which new cells can grow, pulp vitality can be re-established. Revascularisation depends mainly on disinfection of root canal, placement of matrix in canal for tissue growth, impermeable seal of access opening.

Pulp necrosis of an immature tooth as a result of caries or trauma could arrest further development of the root, leaving the tooth with thin root canal walls and blunderbuss apices. The absence of an apical constriction makes root canal treatment cumbersome because of the difficulty to obtain a seal with conventional obturation methods. There are several challenges clinicians face when presented with an incompletely formed root in need of endodontic treatment.

- The mechanical cleaning and shaping of a tooth with thin; fragile lateral dentinal wall is difficult.
- The large volume of necrotic debris contained in a wide root canal is difficult to completely disinfect.
- Obturation of wide canal systems requires precise fabrication of customized gutta-percha
- Danger of splitting of the root during lateral condensation.

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- Risk of extending material beyond apex

Management of such teeth includes surgery and retrograde sealing, calcium hydroxide–induced apical closure (apexification), and, more recently, placement of an apical plug of mineral trioxide aggregate (MTA) and gutta-percha obturation. A novel concept of revascularization of immature nonvital, infected teeth was recently introduced.

Revascularization, per se, is not new. It was introduced by Ostby in 1961[1], and in 1966, Rule and winter documented root development and apical barrier formation in cases of pulpal necrosis in children[2]. In 1972, Ham et al demonstrated apical closure of immature pulpless teeth in monkeys[3]. In 2001 Iwaya et al and in 2004 Banchs and Trope demonstrated the advantages of this treatment modality, which resulted in a radiographically apparent normal maturation of the entire root.[4,5]

Mechanism of Revascularization:

It is possible that a few vital pulp cells remain at the apical end of the root canal and these cells might proliferate into the newly formed matrix and differentiate into odontoblasts under the organizing influence of cells of Hertwig's epithelial root sheath, which are quite resistant to destruction, even in the presence of inflammation[6]. The newly formed odontoblasts can lay down atubular dentin at the apical end, causing apexogenesis (elongation of root), as well as on lateral aspects of dentinal walls of the root canal, reinforcing and strengthening the root.

Another possible mechanism of continued root development could be due to multipotent dental pulp stem cells[7]. These cells from the apical end might be seeded onto the existing dentinal walls and might differentiate into odontoblasts and deposit tertiary or atubular dentin.

The third possible mechanism could be attributed to the presence of stem cells in the periodontal ligament which can proliferate, grow into the apical end and within the root canal, and deposit hard tissue both at the apical end and on the lateral root walls[8].

The fourth possible mechanism of root development could be attributed to stem cells from the apical papilla or the bone marrow[9]. Instrumentation beyond the confines of the root canal to induce bleeding can also transplant mesenchymal stem cells from the bone into the canal lumen. These cells have extensive proliferating capacity.

Another possible mechanism could be that the blood clot itself, being a rich source of growth factors, could play an important role in regeneration[10]. These include platelet-derived growth factor, vascular endothelial growth factor (VEGF), platelet-derived epithelial growth factor, and tissue growth factor and could stimulate differentiation, growth, and maturation of fibroblasts, odontoblasts, cementoblasts, etc from the immature, undifferentiated mesenchymal cells in the newly formed tissue matrix.

Revascularisation protocol:

The first issue is case selection; the best available evidence indicates that this treatment should be considered for incompletely developed permanent tooth that has an open apex and is negative to pulpal responsiveness testing[11]. Teeth with an apical diameter more than 1.1mm demonstrate a greater likelihood of revascularization.[12]

• First Appointment:

The treatment alternatives, risks, and potential benefits should be described to the patient and Guardian after collecting clinical information and establishing pulpal and periradicular diagnose. Following informed consent, the tooth is anaesthetized isolated and accessed

Minimal instrumentation is done. The root canal system is copiously and slowly irrigated with 20ml of Naocl followed by 20ml of 0.12 to 2 percent chlorhexidine, Since canal disinfection relies considerably on chemical irrigants it is important to place the needle into the apical third and irrigate using needles with a closed end and side port vents together with a slow rate of infusion to help to reduce any irrigants passing through the open apex. The canals are dried with paper points, and a mixture of ciprofloxacin, metronidazole, and

minocycline paste as described by Hoshino et al is placed with a lentulo spiral instrument to a depth of 8 mm into the canal[13]. If triple antibiotic paste is used, ensure that it remains below CEJ (minimize crown staining) Seal access cavity with 4mm Cavit and Dismiss patient for 3-4 weeks.

• Second Appointment:

Patient is evaluated for resolution of any signs and symptoms of an acute infection (swelling, pain, sinus tracts etc).The antimicrobial treatment is repeated if resolution has not occurred. Anaesthesia with 3% mepivacaine without vasoconstrictor is used which will facilitate the ability to trigger bleeding into the canal, following isolation and reestablishment of coronal access ,tooth should be copiously and slowly irrigated with 20ml NaOCl,together with gentle agitation with a small file to remove antimicrobial paste . Dry the canal with sterile paper points. Create bleeding into canal system by over-instrumenting (endo file, endo explorer) up to 3mm from CEJ.Place a small piece of CollaPlug may be inserted into the root canal system to serve as absorbable matrix to restrict the positioning of the MTA. Place 3-4mm MTA and reinforced glass ionomer. A 12-18 month recall should be considered the earliest time point to conduct clinical examination.

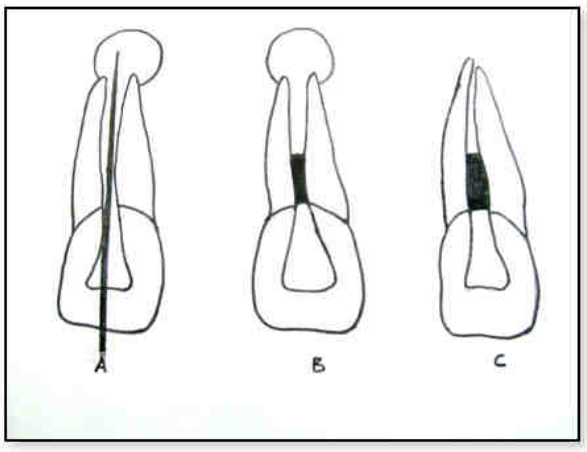

Figure - 1

A. *File is placed beyond the apical foramen and overinstrumented to induce bleeding.* ***B.*** *Root canal is sealed with MTA and composite.* ***C.*** *Apexogenesis and resolution of lesion after 6-12 months.*

Advantages over current treatment modalities:

There are several advantages to revascularisation approach. This approach is technically simple and completed using currently available instruments and medicaments without expensive biotechnology[12]. The regeneration of tissues in the root canal system by patients own blood cells avoids the possibility of immune rejection and pathogen transmission from replacing the pulp with a tissue engineered construct after control of infection[12], it can be completed in a single visit. It is also very cost-effective, because the number of visits is reduced, and no additional material is required. Obturation of the canal is not required unlike in calcium hydroxide–induced apexification, thus eliminates the chance for root fracture during lateral condensation. However, the biggest advantage is that of achieving continued root development (root lengthening) and strengthening of the root as a result of reinforcement of lateral dentinal walls with deposition of new dentin/hard tissue[14].

There are few limitations for this approach. First, Long-term clinical results are as yet not available, and source of regenerated tissue has not been identified. Another disadvantage is revitalized tooth may susceptible to further pulp disease and may require retreatment, It is possible that the entire canal might be calcified, compromising aesthetics and potentially increasing the difficulty in future endodontic procedures if required. In case post and core are the final restorative treatment plan, revascularization is not the right treatment option because the vital tissue in apical two thirds of the canal cannot be violated for post placementThe revascularisation method assumes that the formation of a blood clot yields a matrix that traps the cells capable of forming new tissue. But the concentration and composition of cells trapped in the fibrin clot is unpredictable[13]. This limitation can be overcome by use of platelet concentrates. Platelet rich plasma is an ideal scaffold for revascularization.[15]

Conclusion:

The discovery and understanding of pulp stem cells provide us a better insight into the healing potential of the immature teeth. Along with an

improved regimen of canal disinfection, it seems to be the right time to establish a new protocol for a paradigm shift in treating these infected immature teeth from performing apexification procedures to conserving any dental stem cells that might remain in the disinfected viable tissues to allow tissue regeneration and repair to achieve maturogenesis.

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REVIEW

Caries diagnosis : Through the hawk's eye

Sandeep Lal [1], N.O.Varghese[2], Rajesh Pillai[3], S.U-nu[4]

ABSTRACT:

Recent years have seen a surge in research activity surrounding diagnostic methods for early detection of caries lesion. Caries assessment measures have shifted from exclusive focus on frank, cavitated lesions to detection of early phases of demineralization. Diagnosing dental caries implies detecting the presence of caries lesion and at the same time infer whether it is active, rapidly or slowly progressing or arrested. This article reviews novel technologies like Optical Coherence Tomography and Polarised Raman Spectroscopy which seem to offer a ray of hope for achieving reliable, accurate detection of the early stages of enamel demineralisation. These provide an added arsenal in our quest for detecting caries at the incipient level and also taking preventive dentistry to the next level.

KEY WORDS: Caries, Diagnosis.

Introduction

Dental caries is a common infectious oral disease affecting people worldwide. Detecting early dental caries and monitoring the dynamic processes of demineralization and remineralisation are challenging. Conventional diagnostic methods, such as visual observation and the use of a sharp explorer tool, rely on subjective clinical criteria: for example, colour, softness and resistance to removal.

Approximately 30%–40% mineral loss is necessary before an early enamel carious lesion is visible radiographically. It can take 9 months or longer before demineralization appears radiographically. Accurate diagnosis of occlusal caries including assessment of lesion depth is particularly challenging due to the hypermineralized outer enamel surface (possibly as a result of fluoride treatment) that masks the underlying lesion. Conventional diagnostic techniques lack sufficient high sensitivity and specificity for early lesion detection and are not able to provide information on caries activity.[1]

The growing sophistication in available interventions for prevention and nonsurgical treatment of dental caries is matched by a similar increase in the available methods for diagnosis of carious lesions. This article reviews two such methods used in the detection of tooth demineralization as early as possible.

1. Optical Coherence Tomography (OCT)

This is a non invasive technique which creates cross sectional optical biopsy images of internal tooth tissues. OCT was first proposed for use as a biological imaging system in ophthalmology and gastroenterology by Huang and colleagues in 1991.[2]

OCT provides high resolution (10-30um) morphological depth imaging of incipient caries. With OCT, early lesions can be readily identified as regions of high light backscattering with depth into the enamel as compared to healthy sound enamel.[3,4] From the OCT images, the lesion depth can be approximated to provide clinically useful information to guide treatment decisions. In addition, a parameter known as the "optical

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attenuation coefficient" has been derived in order to distinguish sound from carious enamel non-subjectively.[3]

Principle: While the light becomes scattered in the dense biological tissue, a certain component of the reflected light remains unscattered and thus contains good quantitative and structural image information. The OCT technology maps the changing intensities of reflections from the tissue to form an image of the subject area. This image, displayed on a monitor, has an unprecedented amount of diagnostic information and can be viewed, manipulated, printed out and stored in a digital format.

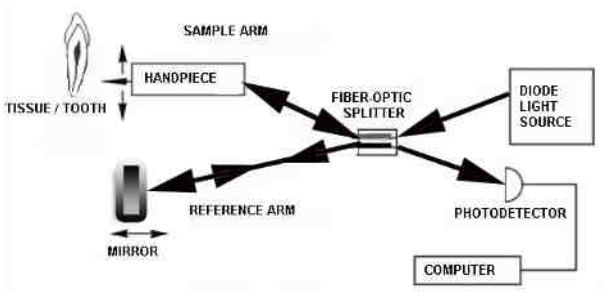

Fig. 1 - Schematic Diagram of the Dental optical coherence tomography (OCT) based on a Michelson White Light interferometer

Method: Information is captured by shining a near-infrared light through a single optical fiber, only 0.006" in diameter, deep into the internal structures of the subject tissue, using a handpiece like scanner.

OCT is similar in operation to ultrasound imaging,but uses light waves rather than sound waves. This technique provides image resolution that is an order of magnitude higher than that obtained by ultrasound imaging. However, where ultrasound is well suited for imaging deep-tissue structures, such as a fetus within a pregnant mother, OCT can only image the first several millimetres of tissues (2–4 mm, depending on the wavelength of light used). Thus, OCT is better suited for imaging nearsurface structures.[1] OCT light is back-scattered by changes in refractive index as the light encounters different tissue types or structures (e.g., enamel vs. dentin, healthy vs. carious regions). Light in the near-infrared region is able to penetrate tissue better than light in the visible region of the spectrum and is non-damaging to human tissues at these intensities.

Most OCT techniques described for imaging dental tissue have used wavelengths of 840 to 1310 nm. This has resulted in imaging depths of 0.6 to 2 mm, respectively. OCT is based upon the interference of light. When a light beam is split into two and then recombined, interference produces a pattern, the intensity of which is determined by the level of light in each beam. OCT systems use Super Luminescent Diodes (SLDs) as a light source. The intensity of the interference is a function of the scattering caused by the changes in tissue structure of the tooth.

Variation in scattering measured in relation to depth from a single point on the tooth surface is called an "A-scan". Taking several A-scans along a line produces information from a 'slice' of tooth tissue, which is the tomogram. The movement along the line of A-scans is known as the "B-scan", and, according to Colston *et al.*(2000), it takes from 30 to 60 sec to acquire a 1-cm-long B-scan.

For an A-scan to be produced, light from a suitable source (in this case an SLD) passes through a beam splitter (Michelson interferometer) to divide it into two coherent (wave peaks and troughs occurring at the same time) beams of light. One beam is called the sample beam and the other, the reference beam. The sample beam goes into the tooth and will be scattered according to the nature of the tissue. It is known that carious tissue scatters light to a greater extent than does sound tooth structure. Some of the sample beam will be scattered back in the direction from which it came (back-scattering), toward the beam splitter. The reference beam travels to a movable mirror, where it is reflected straight back to the beam splitter. Here it is re-combined with the back-scattered sample beam.

The re-combined reference and back-scattered sample beams are focused onto a photodetector, where any degree of interference between the beams can be observed. In this way, changes in the scattering properties of the tooth as a function of depth can be recorded at a single point. For a single A-scan, the movable mirror travels axially through the scan. Repetition of the

exercise by moving the sample beam (on the sample) around 20 μm to one side results in a tomographic 'slice' being taken from the tooth. This is known as the B-scan. [5]

Of clinical relevance is the development of prototype handpieces for intra-oral OCT.[6] Analysis of caries lesions has been rformed, and changes in signal are related to the degree of scattering and possibly the degree of mineralization. Further work has used OCT to assess the restoration-tooth interface for semi-transparent restorations. This could have implications for the non-invasive diagnosis of secondary caries. As with all optical methods, it is likely that uptake of any stain will confound the technique. [5]

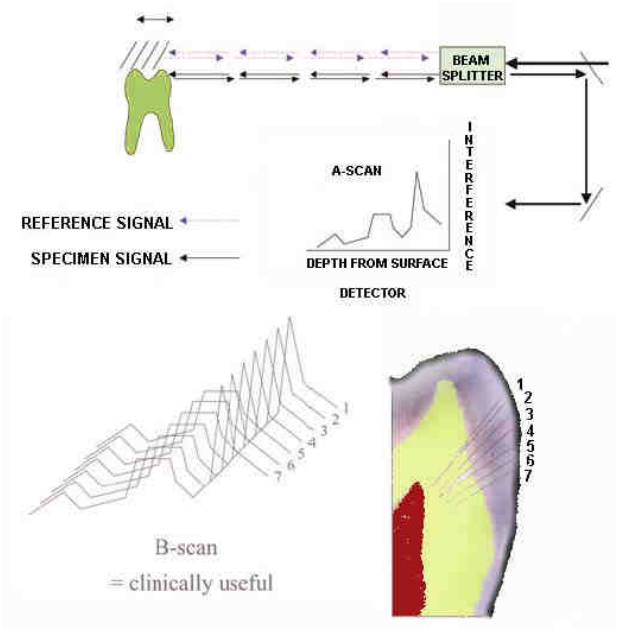

Fig. 2 - A Schematic Diagram of the method by shich OCT produces an A - Scan and the way in which serial A-Scans can be arrnaged to produce a tomographic slice of a tooth known as a B-Scan.

2. Polarized Raman Spectroscopy (PRS):

Raman spectroscopy, a form of vibrational spectroscopy is becoming increasingly important in biomedical research for its high biochemical specificity, low water sensitivity and capability to work in the near-infrared (NIR) region with fibre-optics.

Investigation on early caries lesions was carried out with polarized Raman microspectroscopy and it was found that early caries lesions can be differentiated from sound enamel by monitoring the change in polarization anisotropy or depolarization ratio of the most intense Raman band of hydroxyapatite at 959cm^{-1}. Polarized Raman spectra of caries lesions exhibited a lower degree of Raman polarization anisotropy than those of sound enamel. Such decrease in the Raman polarization anisotropy detected in the Raman spectra of carious lesions is believed to be due to structural changes in the enamel rods and/or increased photon scattering resulting from the larger pores within the caries lesions.[7]

PRS provides biochemical specificity along with molecular structural/ orientational information. With PRS, the Raman depolarization ratio calculated from the main phosphate vibration at ~959 cm^{-1} from parallel and crosspolarized Raman spectra allows discrimination between sound and early developing caries. In combination, OCT and PRS have potential for detecting and monitoring early lesions with high sensitivity and high specificity.[8]

OCT imaging in regions of hypocalcification can sometimes show increased light back-scattering at the surface, which could be misinterpreted as signs of early caries. To help rule out such false-positive readings and increase the specificity of this method, OCT and PRS have been coupled to obtain biochemical information for confirmation of caries.

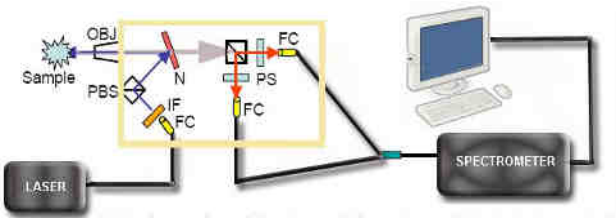

Fig.3 - Schematic overview of the developed fibre-optic coupled polarization - resolved Raman spectroscopic system. (OBJ - Objective Lens ; N.Notch Filter; PBS - Polarizing Beam Splitter, IF - Laser Line Interference Filter; FC- Fibre Collimator, PS - Polarization Scrambler).

PRS provides details on the molecular composition (e.g., collagen in dentin vs. predominantly inorganic apatite in enamel) and molecular structure of cells and tissues. Like OCT, PRS measures light scattering. Although most scattered photons have the same energy and wavelength as the incoming excitation light, about 1 in 10^7 photons scatter at energy different from

that of the incoming light. This energy difference is proportional to the vibrational energy of the scattered molecules within the sample and is known as the Raman Effect. As with other emerging optical methods, the properties of the scattered light within sound or porous carious regions are being explored to determine their use in caries detection.[1,4]

In fluorescence-based techniques, there are a limited number of intrinsic fluorophores that can provide diagnostic information without the addition of external dyes. In contrast, PRS can provide information not only about bacterial porphyrins leached into carious regions, but also about the primary mineral matrix and, thus, the state of demineralization or remineralisation of the tooth. This information is gathered without the need to add extrinsic dyes or agents. PRS provides information on the composition, crystallinity and orientation of the mineral matrix, all of which are affected in caries formation or remineralization.

Studies focus on the phosphate peak from carbonated hydroxyapatite (the main component of dental hard tissues) and how its biochemical signature is affected by demineralization and remineralization. A quantitative parameter known as the "depolarization ratio" has been derived to follow such changes.This ratio is determined by calculating the intensity of the main phosphate peak from parallel- and cross-polarized Raman spectroscopic measurements, then dividing the cross-polarized value by the parallel-polarized value. [1]

Future directions:

- As dentists are accustomed to using dental radiographs for diagnostic purposes, OCT imaging, which shows similar dental morphology, could be readily adopted.
- Incipient lesions are visible on OCT images, with information available regarding lesion location, lesion depth (including proximity to the dentinoenamel junction) and surface characteristics (intact, cavitated or change in contour).
- Surface defects, such as cracks and fissures, should also be detectable by OCT. With PRS, it is possible to confirm that suspicious carious sites are indeed areas of demineralization.
- Preliminary studies have also shown that both OCT and PRS can be used to follow demineralization and remineralization longitudinally using quantitative parameters.
- Both OCT and PRS involve non-ionizing radiation and, therefore, can be used routinely to screen for early lesions, to monitor the caries process, to assess the success of remineralization treatments and to educate and motivate patients.
- A tool with both high sensitivity and high specificity will be a useful adjunct to assist dentists in their decision-making and treatment planning processes. [1]

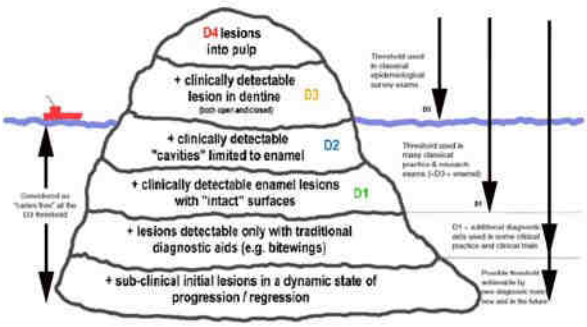

Fig. 3 - Iceberg of carries and the influence of detection system.

Conclusion

The Pitts iceberg (fig. 3) demonstrates that the number of lesions detected increases as the sensitivity of the detection device increases. It can also be seen that the new detection tools are required to identify those lesions that would be amenable to remineralising therapies.[9]

Early diagnosis of the caries lesion has assumed a particular importance, since the ability to detect these reversible early lesions offers several advantages. With quantitative diagnostic methods, the interexaminer variations in caries diagnosis will potentially decrease, and it would also be possible to monitor changes over time in mineral loss related to preventive measures.

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ABOUT THE JOURNAL

The Trivandrum Dental Journal, the official publication of the Indian Dental Association , Trivandrum Branch, is intended to be a research periodical that aims to inform its readers of ideas, opinions, developments and key issues in dentistry - clinical, practical and scientific - stimulating interest, debate and discussion and an opportunity for life long learning ,amongst dentists of all disciplines. All papers published in the TDJ are subject to rigorous peer review by our excellent review board. We have tried to design the journal in such a way that the readers can find the relevant information fast and easily.

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The cover page design

The shanku or the conch was considered as one of the common emblems of majority of Kerala feudal kingdoms of the past, including Travancore. The official Kerala state emblem also symbolises two elephants guarding the imperial conch and its imperial crest. The graphical representation of the conch (' shanku') is adapted to be the design on the cover page of the TRIVANDRUM DENTAL JOURNAL.

The Cover Photograph : Oral cancer is the 11th most common cancer in the world. India alone accounts for one fifth of all oral cancer cases and one fourth of all oral cancer related deaths in the world; it is the most common cancer among men and the third common cancer among women. Oral cancer can be detected early by very simple methods that includes routine mouth examination by a dental surgeon. The paradox is that about 70 % of oral cancers are diagnosed in advanced stages with high mortality. In addition to the painless lesions not being recognised by the patient, oral cancer is one disease that is often overlooked with respect to emphasis on prevention and early detection in clinical practice. Dental surgeons responsible for periodically, and thoroughly, examining the patient's face, neck and oral cavity for the presence of lesions and diseases can immensely contribute to the prevention and control of oral cancer, by devoting some time for routine oral cancer screening.

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