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Dear friends,

Dentistry, as a profession, is very demanding, in terms of the focus and precision required while performing the procedure, more so, because we are working on a very small area, which requires sheer attention. In doing so, many a times, we forget or overlook the posture in which we are working continuously for long hours. When the dentist is working in a sitting position, over half of the body muscles provide support, so as to enable the body to be in a static position. If the same posture is continued for a longer period of time, muscle ischemia happens. As a result, what we get in return is the musculoskeletal disorders which exhibit in the form of pain. The intensity of this pain can vary from mild discomfort in the neck, shoulder and back region to excruciating one, so much so that it leaves us with no choice but for placing a halt on our professional work and then rushing to the concerned specialists for management and respite. As a matter of fact, as it is said “small things can make a big difference,” simple change in our lifestyle, can make a huge difference in the way we can escape this health hazard which is gulping the entire dental fraternity worldwide, like a monster. The “International Yoga Day” was celebrated worldwide on June 21, 2015, attracting everyone’s attention on this indigenous tool in prevention of various health related issues. It is high time we, the dentists, also inculcate the practice of performing Yoga in our daily life regime, to strengthen our muscles of neck, shoulder and back, so as to save ourselves from musculoskeletal pains. The “Asnas” recommended in the Yoga, specifically for posture related problems can be of great help to the dental professionals in managing their day to day muscular discomfort and pain. The need of the hour is just to modify our life style so as to get maximum out of our professional and personal life. Donna Farhi rightly said “Yoga does not remove us from reality or responsibilities of everyday life but rather places our feet firmly and resolutely in the practical ground of experience. We don’t transcend our lives; we return to life we left behind in the hopes of something better.” I hereby strongly recommend neck movements, stretching, intermittent eye closure, and deep breathing during exhaustive hours of working.

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Local Anesthetics In Dentistry - A Review

Sujay B. Shah*, Jigar M. Thakker**, Shrinal Mankiwala***, Hiral Shah****

ABSTRACT

More than 100 years Local anesthetics have been in use in dental practice. In new era of patient comfort while permitting more extensive and invasive dental procedures the local anesthetics developed of nerve blockade injection techniques. A brief history and summary of the current local anesthetics available is reviewed.

KEYWORDS: Local anesthetics, Topical Anesthetics, Injectable Anesthetics.

INTRODUCTION:

“For there was never yet another philosopher who could endure the toothache patiently”

- William Shakespeare

Dental fear is very prevalent in all age groups, across gender, and in all countries. In modern dental practice local anesthesia is the mainstay, with patients demanding better and more painless dental procedures. More than 120 years ago local anesthesia was introduced to the dental profession, today's options for anesthetizing specific sites in the mouth have become more varied, with dental professionals having many more options to ensure the comfort and safety of their patients.¹

Local anesthesia has been defined as a loss of sensation in an area of the body caused by a depression of excitation in nerve endings or an inhibition of the conduction process in peripheral nerves.²

The first local anesthetic agent to be widely used in dentistry was cocaine. Centuries before European exploration of the New World, Peruvian Indians had found that chewing leaves of the coca plant produced exhilaration and relief from fatigue and hunger. Following the import of coca leaves to Europe, much research was conducted to elucidate the properties of the coca leaf extract. In 1859, Albert Niemann refined the coca extract to the pure alkaloid form and named this new drug “cocaine.”³

Unlike the majority of other anesthetic drugs, which act as central nervous system depressants, local anesthetics prevent nociceptive impulses from reaching the central nervous system by blocking the progress of an action potential. A local anesthetic binds to sodium channel receptors on the axonal membrane, the permeability to sodium ions is lost and nerve conduction is interrupted.⁴

TOPICAL ANESTHETICS

A topical anesthetic is used to numb the surface of the gingiva in preparation for injecting a local anesthetic. Unlike injectable anesthesia, topicals anesthetize only the top portion of the mucous membrane or tissue and do not provide anesthesia for the teeth or bony structures. They are used to anesthetize the surface of an injection site. Most topical anesthetics require up to a minute to anesthetize the area. Whenever possible, use topical anesthetics to minimize the patient's pain associated with injections. For example, a topical anesthetic can be applied to a sterile cotton swab and placed just above a canine prior to an injection. It is important to use a topical anesthetic for maxillary lingual injections just medial to the first molar because these can be among the most painful sites for injection. A variety of topical anesthesia agents are available, including lidocaine and benzocaine. In recent years, oral cavity patches have been developed that adhere to the gingiva and deliver targeted, consistent release of topical anesthesia.
These have been found to provide more effective pain relief than topicals applied with a swab when using large needles that are inserted to the bone.¹

**INJECTABLE ANESTHETICS**

Local anesthetics are classified into two general categories according to linkages: amide (NHCO) linkage and ester (COO) linkage. These specialized linkages join to a common carbon chain that is joined to a hydrophilic chain of amino (which confers the pKa of the anesthetic). One key exception is benzocaine, which lacks the amino terminus. While benzocaine is an ester and used mainly in topical formulations, most injectable anesthetics are amides.⁵ All anesthetics have a pKa of 7.5 to 9.5, making them weak bases. Procaine is the prototype for esters, although it is no longer available in dental syringe cartridge form.⁶ Absorption of the pharmacologic agent is dependent on a number of factors, including whether the pH of the tissue has dropped due to localized infection. Other factors include drug solubility, vascularity of the tissue at the injection site, and the impact of the agent on circulation. As such, duration is highly variable and specific for each drug. Onset of anesthetic action and duration are affected by a number of factors. The most significant among these appears to be the pH, which drops when infection is present. Other factors include the pKa of the anesthetics, the concentration of the drug, the amount of vasoconstrictor present, and the injection technique relative to nerve morphology. Since most anesthetics are vasodilators, leading to rapid diffusion away from the site, use of vasoconstrictors, such as epinephrine, increases the duration of anesthetics alone.¹⁰

**NON-INJECTABLE ANESTHETICS**

Non-injectable local anesthetics are a more recent development in dental anesthesiology. U.S. Food and Drug Administration (FDA)-approved for use in adults who need localized anesthesia in periodontal pockets during scaling or root planing, A lidocaine and prilocaine periodontal gel is packaged into single-use cartridges and applied directly into the pocket with a blunt-tip applicator and its specially designed dispenser; it is not for injection. With a 30-second onset and 20-minute duration, it can be applied to one or more periodontal pockets simultaneously. It can be reapplied as needed up to the maximum dosage of five full cartridges at one appointment.¹ Dendists currently have a variety of anesthetic solutions at their disposal, with the major difference being their expected duration of clinical anesthesia. Although these solutions are considered to be generally effective in providing a pain free oral environment for dental treatment, local anesthetic failure remains a common problem in certain instances.

**EFFICIANCY**

The dentist is dependent on the local anesthesia agents as well as his technique.³ The success of mandibular block anesthesia has traditionally been determined by the presence of a feeling of “lip numbness”⁴. Evaluating the efficacy of local anesthetics is more uncertain in symptomatic teeth. Effectively anesthetizing a tooth that contains an acutely inflamed pulp is often difficult. Many factors may affect the success of local anesthesia, some within the practitioner's control and some clearly not. While no single technique will be successful for every patient, guidelines exist that can help reduce the incidence of failure. For this discussion, a failure will be defined as inadequate depth and/or duration of anesthesia to begin or to continue a dental procedure.⁸ Due to a number of factors, such as thicker cortical plates; a denser trabecular pattern; larger, more myelin(lipid)-rich nerve bundles; and morevariable innervation pathways⁹,¹⁰ more problems of inadequate anesthesia occur in the mandibular arch than in the maxillary. Although failures are more common in the mandibular arch, maxillary failures do occur and can be equally frustrating.⁸ Most problems with maxillary anesthesia can be attributed to individual
variances of normal anatomical nerve pathways through the maxillary bone.\textsuperscript{11}

Problems with mandibular anesthesia are most common in the molar region but are by no means limited to these teeth.\textsuperscript{12,13,14} As in the maxilla, most anesthesia problems encountered in the mandible are due to individual variations in the nerve pathways, in other words, accessory innervations.\textsuperscript{14}

The first, and simplest, guideline relates to the extent of anesthesia achieved if, for example, a patient reports profound anesthesia of his or her lower lip and tongue after receiving an inferior alveolar and lingual nerve block injection, but the tooth in question is still sensitive, it is probable that those two nerves have been successfully anesthetized and that the tooth sensitivity is very likely due to accessory innervation.\textsuperscript{8}

Anesthetizing the tooth with an irreversible pulpitis, can be one of the most frustrating problems for any dental practitioner. Whenever possible, prescribing antibiotic therapy to reduce inflammation and allowing the site to settle down may constitute the best course of action. When such a course is not an option, the first step in working through this situation is to deliver an appropriate nerve block injection as far back as possible along the innervation pathway of the hypersensitive tooth. If all of the surrounding soft tissues are numb, but the tooth itself is still sensitive, use of an intraosseous technique, which has a highly predictable success rate, is recommended.\textsuperscript{15,16} Less predictable, but also potentially effective, is a periodontal ligament injection technique.\textsuperscript{17,18} A last resort is to quickly access a pulp horn, creating a hole just large enough to insert a needle, and injecting anesthetic directly into the pulp chamber of the tooth. The major limitation of all three of these injection techniques is the inability to anesthetize multiple teeth with a single needle penetration and the relatively short duration of anesthesia achieved.\textsuperscript{18}

**CONCLUSION**

Local Anaesthesia remains the backbone of pain control in dentistry. Research has continued both in medicine and dentistry to seek new and better means of managing pain associated with many surgical treatments. Much of this research has focused on improvements in the area of local anaesthetic needle and syringes, more successful techniques of regional nerve block and newer drugs.

With the current increased use of sedation techniques pain and anxiety control the need for local anaesthesia has not decreased. It must be remembered that the sedated patient is still conscious and will react to painful stimuli unless these stimuli are properly blocked by a local anaesthetic. That is why a good local anaesthetic technique is stressed as the cornerstone for effective pain and anxiety control.

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8. Local Anesthetics in Dentistry: Then and Now
PERI-IMPLANTITIS VERSUS PERIODONTITIS: AN IMPLIED METAPHOR

Hiral Parikh*, Archita Kikani**, Ankina Joshi***, Sunita Dhaka****, Mihir Shah*****

ABSTRACT

Hard and soft tissues around an osseointegrated dental implant have some similarities with the periodontium of natural teeth. The major difference occurs in collagen fibers, which are parallel to the dental implant surface compared with insertion on the natural teeth, which is perpendicular and functional between bone and cementum. As untreated periodontitis can ultimately lead to loss of natural teeth, peri-implantitis can result in loss of dental implants. Recent studies show that the main causative factor of both tooth loss from Periodontitis and loss of dental implants due to Peri-implantitis is the microbial dental plaque. Another disease that resembles peri-implantitis is mucositis; affecting only the soft tissue component, the occurrence of inflammation at this level is due to plaque accumulation. Peri-implantitis can be considered analogous to periodontitis.

KEYWORDS: Periodontitis, Mucositis, Peri-implantitis

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INTRODUCTION:

Soft and hard tissues surrounding a dental implant have certain similarities with those of natural dentition. The major difference appears in collagen fibers, which are unattached and parallel to the dental implant surface, compared with the insertion on the natural teeth, which is straight and functional, between bone and cementum.¹

The epithelial junction sealing achieved in the gingival sulcus of natural teeth offers protection against bacterial penetration in the mouth. If this seal is broken or gingival epithelial apical fibers are damaged or destroyed, the epithelium migrates rapidly in apical direction, and resulting in periodontal pockets.²

Since there is no cementum or insertion of epithelial fibers in the case of a dental implant, mucosal sealing is extremely important. If the seal is lost, the bacterial infiltration rapidly expands to bone structures.¹

The periodontal parameters' values (depth appreciation of the space around the implant, clinical gingival insertion levels, gingival bleeding on examination with the probing, mobility) are important indicators for detecting potential implant pathological conditions.³

PERIODONTITIS:

Chronic periodontitis is defined as infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss and bone loss.

The etiology of periodontitis has long been unspecified, however etiological factors are classified in: local, systemic, environmental and genetic factors.⁴

The initial lesion in the development of periodontitis is the inflammation of the gingiva in response to a bacterial challenge. Pocket formation starts as an inflammatory change in the connective tissue wall of the gingival sulcus. The cellular and fluid inflammatory exudate causes degeneration of the surrounding connective tissue, including the gingival fibers. Just apical to the junctional epithelium, collagen fibers are destroyed and the area is occupied by inflammatory cells and edema.

Clinical features in periodontitis⁴²:

Characteristic clinical findings in patients with untreated chronic periodontitis may include...
perigingival and subgingival plaque accumulation (frequently associated with calculus formation),
• gingival inflammation,
• pocket formation,
• loss of clinical attachment,
• loss of alveolar bone,
• and occasional suppuration.

In patients with poor oral hygiene, the gingiva typically may be slightly to moderately swollen and exhibit alterations in color ranging from pale red to magenta. Loss of gingival stippling and changes in the surface topography may include blunted or rolled gingival margins and flattened or cratered papillae.

**PERI IMPLANTITIS:**

Peri-implantitis describes pathological changes that occur in soft and hard tissues surrounding the implant. It implies bone damage, in addition to soft tissue damage, and it is caused by bacterial factors, in combination with other predisposing factors. Peri-implant mucositis is a disease affecting only the soft tissue component due to plaque accumulation.

Tissue integration of oral implants consists of two main components:

A. Bone integration

B. Peri-implant soft tissue integration

Clinical features of periimplantitis:
• Bleeding and suppuration on probing
• Swelling of the peri implant tissues
• Pain
• Vertical bone destruction associated with the formation a peri implant pocket.
• Radiological evidence for vertical destruction of the crestal bone.

Criteria for successful dental implant treatment:
• Favorable underlying bone without any inflammatory processes
• Primary stability of the implant after placement
• Osseointegration

Obtaining a superior aesthetic result
• Optimal morphological and functional integration of the implant

Main reasons of peri-implantitis occurrence are:
• The patient did not maintain a good oral hygiene, hence failed osseointegration.
• Abutment was not installed correctly;
• Unadapted prosthesis in relationship to the gingiva in the neck of the implant.

Implant failures due to infection are characterized by a peri-implant bacterial complex resembling that of adult periodontitis. In edentulous subjects, Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis are not as frequently associated with peri-implant infection as in partially edentulous cases.

The bone around a dental implant has a higher thickness and density than that which surrounds natural teeth.

Histological studies have shown that fiber orientation around the implant has the appearance of slings. Although bone-implant interface can be seen, most tissue consists of collagen fibers. Peri implant tissue has the same functions as the periodontal ligament, but structurally it is different. In the Peri-implant fibrous tissue, collagen fibers have a distinctive orientation and a specific interaction with the bone surrounding the implant in direct interrelation with the implant design and loading. These fibers are oriented in the three dimensional space between implant and bone, following the distribution of biomechanical forces.

The bundles of collagen fibres in the periimplant tissue are longer than those of the periodontal ligament, passing from the bone trabeculae to the implant surface. The length of these collagen bundles is the key point for the stability and longevity of the implant.

Peri-implant tissue functions:
1. Piezoelectric effect: It is assumed that occlusal forces are transmitted to the peri-implant ligament,
stimulating the bone where the fibers are inserted. Studies have shown that deformation of the surface of the implant socket, immediately around the implant causes compression, generating a negative charge, while the distal part of the trabeculae is in tension, causing a release that generates a positive charge. The cells help post-traumatic scarring, removes debris and form a protein network, which will calcify later.¹

2. The hydraulic effect: Peri-implant ligament is bathed in fluids in the implant socket. Axial occlusal forces are transmitted to collagen fibers, which in turn act on the fluid that is incompressible and are pushed in the bone, to the bone marrow. Blood vessels create a hydraulic effect appearing also in the natural tooth. When the action ceases, the fluid returns, then the process restarts.¹

3. The buffer effect: Because collagen fibers can be deformed, a buffer effect appears between implant and bone.¹

**TREATMENT OF PERIODONTITIS**

The goal of periodontal treatment is to maintain the health of the teeth and dental implants, to ensure comfort, functionality and aesthetics. With the increasing number of patients receiving dental implants the prevalence of inflammatory problems of the implant receiving tissues is also increasing.¹⁰

**The treatment stages of Periodontitis**:¹⁰

1. Preliminary phase:
   - Treatment of emergencies: Dental or periapical
     - Periodontal
     - Other

   Extraction of hopeless teeth and provisional replacement if needed (may be postponed to a more convenient time)

2. Phase I periodontal therapy or Nonsurgical periodontal therapy:
   - Complete removal of calculus.
   - Correction or replacement of poorly fitting restorations and prosthetic devices
   - Restoration or temporization of carious lesions
   - Orthodontic tooth movement
   - Treatment of food impaction areas
   - Treatment of occlusal trauma
   - Extraction of hopeless teeth
   - Possible use of antimicrobial agents including necessary plaque sampling and sensitivity testing.

3. Phase II Surgical periodontal therapy
   - Periodontal therapy, including placement of implants
   - Endodontic therapy

4. Phase III Restorative phase
   - Final restorations
   - Fixed and removable prostodontic appliances
   - Evaluation of response to restorative procedures
   - Periodontal examination

4. Phase IV Maintenance phase
   - Periodic rechecking: Plaque and calculus

Gingival condition (pockets, inflammation) Occlusion, tooth mobility.

**TREATMENT OF PERI-IMPLANTITIS**

The treatments proposed for Peri-implant disease are based on the evidence gained from the treatment of periodontitis. The surface of the implants facilitates adherence of the bacterial biofilm and complicates its elimination.¹⁰

**Treatment methods of Peri implantitis**:¹⁰

1. Acute bacterial infection control to reduce tissue inflammation:
   - Regeneration of bone structures
   - Complete elimination of inflammatory processes in the peri-implant tissues
   - Reduction in the duration of the treatment
   - Creation of aseptic conditions around the implant
   - Securing the reliability of the implanted artificial supports

   **Treatment methods of Peri implantitis**:¹⁰

Hiral Parikh et. al. : Peri-Implantitis Versus Periodontitis: An Implied Metaphor
• Mechanical debridement in local areas.
• Irrigation in subgingival sulcus to reduce environmental pathogens
• Administration of topical and systemic antibiotics.

2. Regeneration of bone defects.

3. The treatment is surgical correction of the pockets and regeneration of bone defects around the implant.

Re-evaluation intervals post-therapy for Peri-implantitis: Once a patient has developed Peri-implantitis, there is an increased risk of recurrence and is considered a high-risk patient especially if he has a history of periodontal disease and should be assessed at every 3-4 months.

CONCLUSION:

Peri implant mucositis can be considered analogous to gingivitis and Peri-implantitis can be considered analogous to periodontitis. The borderline between gingivitis to periodontitis and mucositis to peri-implantitis is defined by the degradation of connective tissue and it is followed by epithelial migration and bone resorption.

Microbial colonization and inflammatory reactions in the peri-implant tissues might be analogous to key events in the pathogenesis of periodontitis. Peri-implantitis can result in the loss of dental implants just as untreated Periodontitis can lead to the loss of natural teeth. Periodontitis and Peri implantitis both demand an aggressive treatment approach otherwise the exacerbation of the disease can lead to perpetual damage to the surrounding tissue.

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The Journal of Ahmedabad Dental College and Hospital; 6 (1), March 2015 - August 2015

SJÖGREN’S SYNDROME – AN UPDATE FOR THE DENTAL PRACTITIONERS

Roseline Patel*, Bhavin Dudhia**, Parul Bhatia***, Steffy Macwan****, YeshaJani***** Purv Patel******

ABSTRACT

A normal flow of saliva is a luxury we enjoy unconsciously throughout our lives, little realizing the distressing effects that one experiences when this mechanism fails due to different reasons. There are different pathological conditions that cause xerostomia. E.g., salivary gland aplasia, Sjogren's syndrome, chemotherapy, head and neck radiotherapy, Alzheimer's disease, etc. Sjogren's Syndrome (SS) is progressive, debilitating disorder in which the body's immune system destroys the mucinous secretions of exocrine tissues resulting in the hallmark features of dry mouth (xerostomia) and dry eyes (sicca syndrome).

Sjogren's syndrome is of particular interest to the dental profession, since the mouth is a major site of involvement? For optimal oral care of patients with SS, it is essential that the dentist recognize this condition and be involved intimately in the health care delivery team. This is a review on the Sjogren's Syndrome for the same

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INTRODUCTION:

Salivary gland secretions are essential for maintaining the health and integrity of the oral surfaces. The resting flow rate of whole saliva is 0.2 – 0.4ml/min and stimulated flow rate is 1.0 – 2.0 ml/min. Reduced salivary secretion (stimulated and unstimulated) below 0.2ml/min is termed as xerostomia. Sjogren's Syndrome (SS) is a progressive, debilitating disorder in which the body's immune system destroys the mucinous secretions of exocrine tissues resulting in the hallmark features of dry mouth (xerostomia) and dry eyes (sicca syndrome)

Reduced salivary flow is of importance to the dental profession as there is subsequent loss of the antibacterial properties of saliva, which accelerate infection and aggravate different oral conditions like tooth decay and periodontal disease. For optimal care of patients with SS, it is essential that the dentist recognize this condition and be involved intimately in the health care delivery team. This article reviews the Sjogren's Syndrome and its oral implications.

HISTORY AND EPIDEMIOLOGY

The history of this disease is chronicled in a 1987 book entitled Sjogren's Syndrome: Clinical and Immunological Aspects. The first description of SS is generally credited to Johann Mikulicz in 1892. However, the disease is named after a Swedish ophthalmologist Henrik Samuel Conrad Sjogren who studied the disease and published his findings in 1933 in his doctoral thesis. Over the next decades, many papers described the disease, and it appeared that rheumatoid arthritis was related to this syndrome.

A recent review of surveys by the Centre for Disease Control (CDC) has estimated the prevalence of Sjögren's syndrome in the western countries to be up to 1%; however it was estimated to be 0.5% in North India. It has been reviewed that, Sjogren syndrome is undiagnosed in nearly half of patients, due to its insidious nature.

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ETIOPATHOGENESIS AND CLINICAL FEATURES

Sjogren's syndrome may occur in two forms: Primary Sjogren's syndrome (PSS) and Secondary Sjogren's syndrome (SSS). Primary Sjogren's syndrome manifests only as dry eyes and dry mouth. Secondary Sjogren's Syndrome (SSS) comprises of dry eyes, dry mouth together with a connective tissue or autoimmune disease. Also, despite extensive study of the underlying cause of Sjögren's syndrome, the pathogenesis remains obscure. In broad terms, the pathogenesis is multifactorial; environmental factors are thought to trigger inflammation in individuals with a genetic predisposition to the disorder. (Figure - 2).

In contrast to many other organ-specific autoimmune disorders, affected tissue can be obtained easily in Sjögren's syndrome by minorsalivarygland biopsy. It has been reported that there are drastic changes in immune homeostasis in the salivary glands before SS patients present to a physician with symptoms of dry eyes and dry mouth. Several theories have been suggested in the pathogenesis of SS, like abnormalities related to the upregulation of type I interferon regulated genes, abnormal expression of B-cell-activating factor (BAFF), environmental triggers like viral infections (HTLV-1, EBV, HIV), activation of HLA independent immune system, autoantibodies - Ro/SSA and La/SSB, autoantibodies to muscarinic M3 receptors, X chromosome linked factors, and hormonal influences (estrogen and prolactin). Oral, ocular and extraglandular manifestations occur as a result of lymphocytic infiltration into other tissues or generation of pathogenetic autoantibodies.

ORAL MANIFESTATIONS

The salivary gland dysfunction in PSS is of significant clinical importance and may cause salivary glande enlargement chronic oral discomfort as well as compromised oro-pharyngeal functions. (Figure - 3)

The most common direct consequence of salivary gland dysfunction in Sjogren's syndrome is dry mouth. (Figure - 4)

Since the extent of salivary dysfunction is variable and patients differ in their tolerance of dryness, symptoms of dry mouth are also variable. SS patents with hyposalivation display a decrease in the concentration of mucin, MUC5B and amylase in the saliva. The mucosa becomes dessicated and friable causing dysphagia, adherence of food to the
buccal or palatal surfaces, trauma while chewing, difficulty in speaking continuously, frequent need to sip water, discomfort with denture wearing, burning sensation on eating spicy food.\(^2,18\)

Numerous signs of reduced salivation associated with Sjogren's syndrome include loss of papillae and a lack of normal salivary pooling beneath the tongue. The tongue may be furrowed, atrophic, coated and/or depapillated.\(^20\) In severe cases fissures may develop on the tongue and lips. The dryness extends to the nose, pharynx, larynx, and nasal sinuses.\(^21\)

Hyposalivation also means fewer buffering and flushing opportunities for the oral hard tissues.\(^22\) Lack of saliva may predispose to atypical dental decay observed on the cervical, incisal and radicular portions of the teeth.\(^23\) (Figure - 5)

With reduced saliva in the oral cavity, the ability to control opportunistic infections is also reduced.\(^24\) It has been suggested that most PSS patients exhibit oral candidiasis with the clinical appearance ranging from psuedomembranous (white plaques that can be rubbed off) to erythematosus, hyperplastic and angular chelitis.\(^17\)

**OCULAR AND EXTRAGLANDULAR MANIFESTATIONS**

SS patients present with reduced lacrimal secretions, diminished tear film quality, conjunctival inflammation and corneal ulcerations.\(^25,26\) Ocular complaints may include photosensitivity, erythema, eye fatigue and discharge from the eyes.\(^3\) Secondary form of SS present with a myriad complications like fibromyalgia, leucopenia, dry skin, Raynaud's phenomenon, lymphoid interstitial pneumonitis, B cell lymphoma of the mucosa-associated lymphoid tissue (MALT), gastointestinal disturbances, neurological complications, hypothyroidism, vaginal dryness, glomerulonephritis, etc.\(^10\)

**DIFFERENTIAL DIAGNOSIS, DIAGNOSTIC CRITERIA AND INVESTIGATIONS**

When approaching a patient with possible SS, it is important to rule out other causes of dry eyes (Xeropthalmia), dry mouth (Xerostomia), parotid gland enlargement and other autoimmune disorders.\(^1\) The differential diagnosis of dry mouth should include Sjögren's syndrome, drug-induced hyposalivation, previous head and neck radiotherapy, pre-existing lymphoma, sarcoidosis, hepatitis C infection, AIDS and graft versus host disease.\(^27\) Early diagnosis and treatment are important for preventing disease complications. The sign of dryness like dry mouth, and caries are very useful signs to start investigating for Sjögren's syndrome.\(^29\) (Figure - 6)

![FIG 5 : Cerival Caries](image)

**INVESTIGATIONS FOR SJÖGREN'S SYNDROME**

<table>
<thead>
<tr>
<th>Ocular test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schirmer test</td>
</tr>
<tr>
<td>Slit lamp illumination test</td>
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<td>Tear break up time test</td>
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<tr>
<td>Laser scanning confocal microscopy</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Oral tests</th>
</tr>
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<tbody>
<tr>
<td>Salivary tests</td>
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<tr>
<td>Sialometry</td>
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<tr>
<td>Sialochemistry</td>
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<tr>
<td>Salivary glands tests</td>
</tr>
<tr>
<td>Biopsy</td>
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<tr>
<td>Sialography</td>
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<tr>
<td>Scintigraphy</td>
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<tr>
<td>Serological tests</td>
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<tr>
<td>advanced tests</td>
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<tr>
<td>Magnetic resonance imaging</td>
</tr>
<tr>
<td>ultrasound</td>
</tr>
</tbody>
</table>

FIG 6 : List Of Investigations Of Sjögren's Syndrome

Until recently there were a various set of criteria given for diagnoses of SS.\(^10\) But the discrepancies in the diagnostic criteria led to substantial confusion in
research and clinical trials. Hence, the Sjögren's International Collaborative Clinical Alliance (SICCA) in 2012, proposed a new expert consensus approach consisting of classification criteria based entirely on objective measures. According to this criteria case definition requires at least 2 out of the following:

1. Positive serum anti-SSA &/or anti-SSB or [positive rheumatoid factor & ANA ≥ 1:320]
2. Ocular staining score ≥ 3
3. Presence of focal lymphocytic sialadenitis with focus score ≥ 1 focus/4mm² in labial salivary gland biopsies

**ORAL TESTS**

**SIALOMETRY**

Sialometry aims to measure the salivary flow, and can be conducted with whole saliva or saliva obtained from a specific gland, both with or without stimulation. For a diagnosis of hyposalivation, the unstimulated whole saliva flow rate (UWSFR) has been proposed as the test of choice, as it may be reduced, even if the stimulated whole saliva is unaffected. Values lower than 0.1 ml/min are considered abnormal. This test quantifies salivary secretion from all the salivary glands and is believed to show alterations at the early stages of the disease, being highly reproducible.

According to the Revised International Classification Criteria, the unstimulated whole saliva produced over a period of 15 minutes, without the subjects having eaten or smoked for at least 2 hours, should be measured. A result of lower than 1.5 ml values would transpose to a positive test result for xerostomia. Collection of the stimulated parotid saliva, and subsequent assessment of the flow rate, can be conducted with the help of special suction cups placed over the Stensen's duct. Stimulated saliva is usually collected for 3 minutes and values less than 0.5 ml/min are considered abnormal. Despite the high sensitivity, the stimulated parotid saliva sialometry may fail to reveal alterations at the initial stages of the disease, requires special equipment and may not be easily tolerated by patients. Stimulated saliva assessment can be complicated in patients who do not tolerate the stimulus of salivation and, moreover, due to the wide variety of stimuli used like citric acid, gum, paraffin etc., there is a generalized lack of agreement for normal values.

**SIALOCHEMISTRY**

Sialochemistry involves the analysis of salivary composition, including both organic and inorganic constituents, by means of different biochemical, electrophoretic and immunological analytical methods. They aim to address the injuries submitted to salivary glands regarding secretion content. Differences regarding protein expression were observed in SS patients and healthy subjects. However, individual analysis of SS patients exhibited distinct patterns of protein expression and did not correlate with the clinical, serological or histological severity of disease. Also ionic changes were observed in SS-affected individuals, namely regarding the levels of chloride, potassium, calcium, sodium and magnesium. Furthermore, some SS patients produce little or no saliva which limits sialochemistry applications.

**MINOR SALIVARY GLAND BIOPSY**

Minor salivary gland biopsy remains a highly used diagnostic procedure for the salivary component of SS. (Figure - 7)
periductal or perivascular distribution. The inflammatory infiltrate is quantified and a cluster of 50 lymphocytes is termed a focus. The numbers of foci in an area of 4 mm² of tissue surface render the focus score.²³⁰ A focus score of 1 or more, as according to SICCA is considered positive for SS diagnosis.²⁶,²⁸

A false negative biopsy result range from around 20 to 40% and false positive biopsy results have been found up to 10% of healthy individuals. Patients affected by myasthenia gravis, sialolithiasis and other autoimmune disorders not associated with sicca symptoms may also reveal minor salivary gland infiltration.³² The extent of infiltrates in a lip biopsy using the same methodological approach may vary greatly from gland to gland in a single patient.

**SIALOGRAPHY**

This technique requires the radiographic imaging of a salivary gland, following the retrograde injection of a contrast medium through the excretory duct. (Figure - 8)

Sialography is a technically challenging, time consuming, painful and risky technique. In fact, it is contraindicated in severe gland dysfunction due to the risk of indefinitely retaining the contrast medium.³⁴ Also, several reports showed that the diagnostic value of parotid sialography for diagnosing SS greatly depends on the skills of the observer.³² Nonetheless, given the potentially high sensitivity and specificity in SS diagnosing, as well as its useful staging potential, sialography still has its use in the evaluation of the oral component of SS.

**SCINTIGRAPHY**

The oral component of Sjogren’s syndrome also may be evaluated by salivary gland scintigraphy. Scintigraphy is a non-invasive method to evaluate the function of salivary glands by observing the uptake and secretion of a radioactive labelled substance (sodium pertechnate of ⁹⁹ᵐTc).³⁴ The radionuclide is infused intravenously, and the images of the salivary glands are captured after 1 hour. The uptake of the radionuclide by the glands is observed as well as the amount of saliva containing the radionuclide.² In Sjögren's syndrome, lower concentration and less secretion into the mouth are seen. The test reports a high sensitivity but a low specificity in SS diagnosis. Also, this technique needs special equipment and staff that can only be found in reference clinical centers. Further, it may be unacceptable for the patient due to risk of radiation damage and high cost.³²

**TREATMENT & PROGNOSIS**

As mentioned previously, Sjogren's syndrome (SS) is not only a disease of the exocrine glands but a systemic condition. Therefore, it is recommended that all SS patients should be assessed at appropriate specialist services, which should include oral medicine/dental and maxillofacial radiology, ophthalmology and rheumatology.²⁷ At present,
only symptomatic treatment is available and no treatment can modify the evolution of SS.\textsuperscript{11}
• The primary therapeutic approach to sicca manifestations in Sjögren's syndrome (SS) should be symptomatic relief, using artificial tears and saliva substitutes
• Patients with severe or refractory keratoconjunctivitis sicca might require the addition of topical cyclosporine A to suppress the underlying inflammation
• The treatment of choice for patients with moderate or severe oral dryness and residual salivary gland function is an oral muscarinic agonist
• The management of extraglandular features must be tailored to the specific organ involved, mainly using corticosteroids and immunosuppressive agents.\textsuperscript{37} (Table - 1)

<table>
<thead>
<tr>
<th>Manifestations</th>
<th>Therapy</th>
</tr>
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<tbody>
<tr>
<td><strong>Ocular</strong></td>
<td></td>
</tr>
<tr>
<td>Xerophthalmia</td>
<td>Artificial tears: preserved/non-preserved</td>
</tr>
<tr>
<td>Blepharitis</td>
<td>Punctal occlusion</td>
</tr>
<tr>
<td>Iritis/Uvitis</td>
<td>Topical cyclosporin</td>
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<tr>
<td></td>
<td>Topical androgen (in trial)</td>
</tr>
<tr>
<td></td>
<td>Topical purinogenic receptor agonist (in trial)</td>
</tr>
<tr>
<td></td>
<td>Topical (non-preserved) steroids</td>
</tr>
<tr>
<td></td>
<td>Autologous serum tears</td>
</tr>
<tr>
<td></td>
<td>Lid scrubs for blepharitis</td>
</tr>
<tr>
<td></td>
<td>Bandage contact lens</td>
</tr>
<tr>
<td><strong>Oral</strong></td>
<td></td>
</tr>
<tr>
<td>Xerostomia</td>
<td>Mechanical stimulation</td>
</tr>
<tr>
<td>Periodontitis</td>
<td>Regular oral hygiene</td>
</tr>
<tr>
<td>Gingivitis</td>
<td>Topical fluoride</td>
</tr>
<tr>
<td>Oral candidiasis</td>
<td>Artificial saliva and lubricants</td>
</tr>
<tr>
<td></td>
<td>Secretagogues, including pilocarpine, cevimeline</td>
</tr>
<tr>
<td></td>
<td>Anhydrous maltose lozenge</td>
</tr>
<tr>
<td></td>
<td>Interferon alfa (in trial)</td>
</tr>
<tr>
<td></td>
<td>Therapy for oral candidiasis</td>
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<tr>
<td></td>
<td>Diet modification</td>
</tr>
<tr>
<td></td>
<td>Gene therapies (preclinical)</td>
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<tr>
<td><strong>Joint/ Muscle</strong></td>
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<tr>
<td>Arthralgia/myalgia</td>
<td>NSAIDs</td>
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<tr>
<td>Arthritis/Myositis</td>
<td>Antimalarial drugs</td>
</tr>
<tr>
<td></td>
<td>Disease-modifying anti-arthritic drugs, including methotrexate, azathioprine, leflunomide</td>
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<tr>
<td></td>
<td>TNF inhibitors</td>
</tr>
<tr>
<td></td>
<td>Anti-CD20 (in trial)</td>
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<tr>
<td><strong>Cutaneous</strong></td>
<td></td>
</tr>
<tr>
<td>Raynaud's syndrome</td>
<td>Corticosteroids (topical and systemic)</td>
</tr>
<tr>
<td>Hyperglobulinaemiaipurpura</td>
<td>Tacrolimus (topical)</td>
</tr>
<tr>
<td>Mixed cryoglobulinemia</td>
<td>Antimalarials</td>
</tr>
<tr>
<td>Erythema multiforme</td>
<td>Disease-modifying anti-arthritic drugs for vasculitis</td>
</tr>
<tr>
<td>Erythema annulare</td>
<td>Cytotoxic agents</td>
</tr>
<tr>
<td>Necrotising vasculitis</td>
<td></td>
</tr>
<tr>
<td>Vitiligo, xerosis, alopecia</td>
<td></td>
</tr>
<tr>
<td>Amyloid anetoderma</td>
<td></td>
</tr>
<tr>
<td>Embolic and thrombotic lesions</td>
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</tbody>
</table>
Sjogren's syndrome is a disease of exocrine glands which also manifests in other organs.\textsuperscript{27} It may plateau or worsen, but very rarely undergoes into remissions. Some people may experience only the mild symptoms of dry eyes and mouth, while others have more severe symptoms of disease.\textsuperscript{38} Patients with severe cases are much more likely to develop lymphomas than patients with mild or moderate cases. The most common lymphomas are salivary extranodal marginal zone B-cell lymphomas (MALT lymphomas in the salivary glands) and diffuse large B-cell lymphoma.\textsuperscript{39}

**CONCLUSION**

Sjogren's syndrome (SS) is a slowly progressing autoimmune disease, affecting predominantly middle-aged women, with a female to male ratio reaching 9:1. It is characterized by lymphocytic infiltration of the exocrine glands, mainly the lacrimal and salivary glands, resulting in reduced secretory functions.

The diagnosis and treatment of this disease are frequently delayed, due to the unclear etiology, pathogenesis and multiple system involvement. Dental practitioners can play a crucial role in the early diagnosis and management of the oral manifestations of patients with SS.

Hence, educating the dental practitioners to recognize the disease and refer to the proper specialist should be an ongoing effort.

**REFERENCES:**

25. GRAY H. ANATOMY OF THE HUMAN BODY; 1918.
The human dentition does not always consist of 32 teeth. At times, extra tooth/teeth may be present. A supernumerary tooth is any tooth or teeth substance in excess of the usual configuration of twenty deciduous teeth and thirty two permanent teeth. Supernumerary teeth are one of the common dental anomalies which are prevalent in all populations, in both dentitions, in all age groups. They may present themselves in multiple locations within the oral cavity. Multiple supernumerary teeth are also associated with certain syndromes. Hence, a clinician must possess a sound knowledge about this developmental anomaly in order to correctly diagnose as well as plan the treatment. This study focuses on the clinical and radiographic findings of supernumerary teeth as well as their associated complaints and effects on surrounding structures.

**KEYWORDS**: supernumerary tooth, mesiodens, distomolar, hyperdontia

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proportionately far behind – by lower premolars, upper lateral incisors, lower fourth molars and lower central incisor region. Supernumerary teeth in upper premolars, upper and lower canines and lower lateral incisor region. Supernumerary teeth happen with smaller frequency in deciduous teeth, being more common in upper incisor area. However, when multiple supernumerary teeth are present in the absence of any associated systemic condition/syndrome, the mandibular premolar region is the common site of occurrence. According to their shape, supernumerary teeth can be classified into four types: (1) tuberculate (barrel-shaped, with more than 1 cusp or tubercle); (2) supplemental (identical to the morphology of teeth in the normal series); and (3) conoid (peg-shaped conical tooth). (4) Odontoma. Conical shaped supernumerary teeth are the most common and are usually found in the anterior maxillary area. Supplemental supernumerary teeth usually occur in the premolar region, while tuberculate are associated with delayed eruption of adjacent incisors.

Multiple supernumerary teeth (hyperdontia) are commonly associated with various syndromes such as Gardner’s syndrome, Fabry-Anderson syndrome, Ehlers-Danlos syndrome, Nance-Horan syndrome, steroid dehydrogenase deficiency, Rothmund-Thomson syndrome, facial fistulas or cleidocranial dysplasia or also in association with cleft lip and palate. Clinically, supernumerary teeth are able to cause various local disturbances, including retention of the primary tooth, delayed eruption of the permanent tooth, food lodgment, interproximal caries, ectopic eruptions, tooth displacements, diastema, follicular cysts and other alterations, requiring surgical or orthodontic intervention. Conventional radiographs in the form of intraoral periapical (IOPA), occlusal, orthopantomograph (OPG) and lateral cephalograph are taken to know position of supernumerary teeth. OPG is advised in cases of multiple supernumerary teeth which serves as a screening aid and provides additional information regarding supernumerary teeth. Tube shift technique enables the practitioner to decide the position of supernumerary teeth. Nevertheless, in some cases, they do not provide all the information needed in order to locate the supernumerary teeth three dimensionally in relation to the adjacent structures and to make decisions about therapeutic options. In such cases, computed tomography (CT) can be used as a basic technique to assess patients with supernumerary teeth, and recently, cone-beam computed tomography (CBCT) has been suggested as a substitute for CT due to its low radiation dose and lower cost.

Extraction of these teeth is a general rule for avoiding complications. Kruger considers that the extraction of supernumerary teeth should be postponed until the apices of the adjacent teeth have sealed. According to Donado, treatment should be provided as soon as possible in order to avoid displacement and delayed eruption of permanent teeth. When dealing with unerupted supernumerary teeth, it should be understood that each case must be fully studied with a multidisciplinary approach (pedodontics, orthodontics and oral surgery) so as to decide the prime moment for extraction. Likewise, an evaluative monitoring should also be done.

MATERIALS AND METHODS

• The study included total 50 patients coming to the Out Patient Department (OPD) of the Oral Medicine and Radiology Department of the institute during the period July 2009 to June 2010.
• 50 patients were selected from the dental OPD with criteria of an extra tooth in any arch as clinical finding or incidental finding during routine clinical or radiographic examination.
• All 50 patients were asked specific questions prepared for this study and the related details were
filled in the special proforma prepared for the study.
• General examination of all the patients was done to see any abnormality related to head, facial appearance, clavicle, abdominal pain, diarrhea, constipation and rectal bleeding, etc. to rule out any related syndrome.
• Intraoral examination was carried out to see the dentition in which supernumerary teeth is present as well as to determine its location, number, size and shape, cuspal anatomy, eruption status and to see any harmful effect on the dentition.
• Clinical photographs of all patients were taken.
• Radiographs in form of IOPA, radiovisuograph (RVG), occlusal or OPG were taken to evaluate the root morphology of supernumerary teeth & its relation with surrounding structures.
• In patients with erupted supernumerary teeth, diagnostic impressions were taken and study models were prepared to evaluate the exact position and relation of the supernumerary teeth with adjacent teeth.
• On the basis of clinical and radiographic findings, final diagnosis was made and treatment plan was decided accordingly.

RESULTS

A total of 50 patients were included in the study selected from OPD (7649 patients) of the institute. Based on the epidemiological results obtained, the prevalence rate of supernumerary teeth in the present study was 0.65%.

Table I shows age and gender distribution of patient with supernumerary teeth. Maximum patients [13 (26%)] were between age group of 21 to 30 years and least patients were recorded between 51 to 70 years [2(4%)]. It was found to be more common in males [39 (78%)] than in females [11 (22%)]. Familial tendency for the occurrence of supernumerary teeth was not seen in any patient.

Table II shows distribution of patient based on their chief complain. Out of 50 patients, most of the patient [34(68%)] came with a chief complain which was not related to supernumerary teeth. Out of these 34 patients, maximum patient [15(44.12%)] had other teeth (other than mesiodens, paramolar and distomolar) followed by mesiodens [9 (26.47%)], distomolar [6 (17.65%)] and paramolar [4 (11.76%)]. 11 (22%) patients came with a chief complain which was related with effect of supernumerary teeth on surrounding dentition e.g. spacing, diastema, displacement, etc. of which 7 (63.64%) patients were having mesiodens and 4 (36.36%) patients were having paramolar. 5 (10%) patients came with a specific complain of an extra tooth in oral cavity of which all patients (100%)were having mesiodens.

Table III shows distribution of supernumerary teeth in all the three types of dentition (deciduous/mixed/permanent). It was found that supernumerary teeth were commonly found in permanent dentition [38 (76%)] followed by mixed dentition [11 (22%)] and deciduous dentition [1
In permanent dentition, 16 (42.11%) patients were having mesiodens, followed by paramolar and other in 8 (21.05%) patients each and 6 (15.79%) patients with distomolar. In mixed dentition, 6 (54.55%) patients had other teeth and 5 (45.45%) patients were having mesiodens. In deciduous dentition, only one patient (100%) with other teeth was seen.

**TABLE III**

<table>
<thead>
<tr>
<th>Dentition</th>
<th>Mesiodens</th>
<th>Paramolar</th>
<th>Distomolar</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous</td>
<td>0</td>
<td>0</td>
<td>1 (100%)</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Mixed</td>
<td>5 (45.45%)</td>
<td>0</td>
<td>6 (54.55%)</td>
<td>11 (22%)</td>
<td>22 (44%)</td>
</tr>
<tr>
<td>Permanent</td>
<td>16 (42.11%)</td>
<td>8 (21.05%)</td>
<td>8 (21.05%)</td>
<td>38 (76%)</td>
<td>50 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (42%)</td>
<td>8 (16%)</td>
<td>6 (12%)</td>
<td>15 (30%)</td>
<td>43 (86%)</td>
</tr>
</tbody>
</table>

Table IV shows distribution of supernumerary teeth in maxilla and mandible along with their presence in single and pair forms. It was found that mesiodens were seen most common in maxilla [21 (100%) patients]. Out of these 21 patients, it occurred singly in 19 (90.48%) patients while in pair in 2 (9.52%) patients. Paramolar were seen more in maxilla [6 (75%) patients] than in mandible [2 (25%) patients]. In maxilla 4 (50%) patients had single paramolars while 2 (25%) patients had paired paramolars. In mandible, only 2 (25%) patients with single paramolar were seen. Distomolar were found more common in maxilla [4 (66.68%) patients] than in mandible [2 (33.32%) patients]. In maxilla they were all singly present whereas in mandible [1 (50%) patients] was single and [1 (50%) patients] was paired. Supernumerary teeth in other locations were more common in maxilla [12 (80.00%) patients] than in mandible [3 (20.00%) patients] and all were singly present.

**TABLE IV**

<table>
<thead>
<tr>
<th>TEETH</th>
<th>Mesiodens</th>
<th>Paramolar</th>
<th>Distomolar</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>19 (90.48%)</td>
<td>4 (50%)</td>
<td>4 (66.68%)</td>
<td>12 (80%)</td>
<td>39 (78%)</td>
</tr>
<tr>
<td>Paired</td>
<td>2 (9.52%)</td>
<td>2 (25%)</td>
<td>0</td>
<td>0</td>
<td>4 (8%)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (42%)</td>
<td>6 (12%)</td>
<td>4 (8%)</td>
<td>12 (24%)</td>
<td>43 (86%)</td>
</tr>
<tr>
<td>Mandible</td>
<td>0</td>
<td>2 (25%)</td>
<td>1 (16.66%)</td>
<td>3 (20%)</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>Paired</td>
<td>0</td>
<td>0</td>
<td>1 (16.66%)</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>2 (4%)</td>
<td>3 (6%)</td>
<td>7 (14%)</td>
<td>7 (14%)</td>
</tr>
</tbody>
</table>

Table V shows distribution of various types of supernumerary teeth (Mesiodens/Paramolar/Distomolar/other) according to their different shapes. Mesiodens was seen more in conical form [22 (95.65%) patients] (Figure 1) followed by molariform form [1 (4.35%) patient] (Figure 2) Tuberculate, supplemental and globular forms were not seen in mesiodens. Paramolars (Figure 3) were commonly seen in conical form [6 (60.00%) patients] followed by supplemental [3 (30.00%) patients] and tuberculate form [1 (10.00%) patients]. Distomolar were commonly seen in conical form [6 (85.71%) patients] followed by tuberculate form [1 (14.29%) patient]. Other supernumerary teeth were seen in supplemental form [8 (53.33%) patients] followed by conical [6 (40.00%) patients] and globular form [1 (5.88%) patient].

**TABLE V**

<table>
<thead>
<tr>
<th>Teeth</th>
<th>Mesiodens</th>
<th>Paramolar</th>
<th>Distomolar</th>
<th>Others</th>
<th>Total (Out of 50 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conical</td>
<td>22 (55.00%)</td>
<td>6 (15.00%)</td>
<td>6 (15.00%)</td>
<td>6 (15.00%)</td>
<td>40 (72.73%)</td>
</tr>
<tr>
<td>Tuberculate</td>
<td>0</td>
<td>1 (50.00%)</td>
<td>1 (50.00%)</td>
<td>0</td>
<td>2 (03.63%)</td>
</tr>
<tr>
<td>Supplemental</td>
<td>0</td>
<td>3 (27.27%)</td>
<td>0</td>
<td>8 (72.73%)</td>
<td>11 (22.00%)</td>
</tr>
<tr>
<td>Globular</td>
<td>0</td>
<td>0</td>
<td>1 (100%)</td>
<td>0</td>
<td>1 (01.82%)</td>
</tr>
<tr>
<td>Molariform</td>
<td>1 (100%)</td>
<td>0</td>
<td>0</td>
<td>1 (100%)</td>
<td>1 (01.82%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23 (41.82%)</td>
<td>10 (18.18%)</td>
<td>7 (12.73%)</td>
<td>15 (27.27%)</td>
<td>55 (100%)</td>
</tr>
</tbody>
</table>
Table VI shows distribution of supernumerary teeth based on their eruption status in oral cavity. Maximum supernumerary teeth were fully erupted [34 (61.82) patients] followed by unerupted [16 (29.09) patients] and partially erupted [5 (9.09) patients] supernumerary teeth. Fully erupted supernumerary teeth were 14 (41.18%) mesiodens followed by 9 (26.47%) other supernumerary teeth, 8 (23.53%) paramolars and 3 (08.82%) distomolars. Unerupted supernumerary teeth were 7 (43.75%) mesiodens followed by 5 (31.25%) other supernumerary teeth, 2 (12.50%) each paramolars and distomolars which were diagnosed incidentally on radiographs (Figures. 4 & 5). Partially erupted supernumerary teeth were 2 each (40%) mesiodens and distomolars and 1 (20%) other supernumerary teeth.

### TABLE VI

<table>
<thead>
<tr>
<th>Teeth</th>
<th>Mesiodens</th>
<th>Paramolar</th>
<th>Distomolar</th>
<th>Others</th>
<th>TOTAL (out of 50 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully Erupted</td>
<td>14 (41.18%)</td>
<td>8 (23.53%)</td>
<td>3 (08.82%)</td>
<td>9 (26.47%)</td>
<td>34 (61.82%)</td>
</tr>
<tr>
<td>Partially Erupted</td>
<td>2 (40.00%)</td>
<td>0</td>
<td>2 (40.00%)</td>
<td>1 (20.00%)</td>
<td>5 (09.09%)</td>
</tr>
<tr>
<td>Unerupted</td>
<td>7 (43.75%)</td>
<td>2 (12.50%)</td>
<td>2 (12.50%)</td>
<td>5 (31.25%)</td>
<td>16 (29.09%)</td>
</tr>
<tr>
<td>TOTAL (out of 50 patients)</td>
<td>23 (41.82%)</td>
<td>10 (18.18%)</td>
<td>7 (12.73%)</td>
<td>15 (27.27%)</td>
<td>55</td>
</tr>
</tbody>
</table>

Table VII shows other lesions associated with supernumerary teeth. Only 3 (6%) patients showed associated lesion with supernumerary teeth. The lesions seen were dentigerous cyst, partial anodontia (Figure. 6), and complex odontoma in 1 patient (2%) each.

### TABLE VII

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Total (out of 50 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentigerous Cyst</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Partial Anodontia</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Complex Odontoma</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Total (out of 50 patients)</td>
<td>3 (6%)</td>
</tr>
</tbody>
</table>

Figures 3, 4, and 5 show photographs and radiographs illustrating the distribution and associated lesions of supernumerary teeth.
Table VIII shows the effects of supernumerary teeth on the dentition. The most common being displacement [8 (16%) patients] (Figure 7) spacing [6 (12%) patients] and diaesthesia [5 (10%) patients]. Displacement was seen in 6 (75%) patients with mesiodens and 2 (25%) patients with other supernumerary teeth. Spacing was seen in 3 (50%) patients each with mesiodens and other supernumerary teeth. Diastema was seen in 5 (100%) patients with mesiodens. Impacted teeth, crowding and fusion were found in one (2%) patient each (Figure 8).

No effect was seen in 8 (28.57%) patients each with paramolars and distomolars followed by 6 (21.43%) patients each with mesiodens and other supernumerary teeth.

Treatment of supernumerary teeth depends on chief complain of patient and its effect on permanent dentition. Extraction and orthodontic treatment is advised as required in patient with supernumerary teeth.

DISCUSSION

Supernumerary teeth are infrequent developmental dental alterations that may manifest in any zone of the dental arches and involve any tooth. They may be associated with syndromes or can be found in non-syndromic population also. The prevalence rate of supernumerary teeth found in present study was in accordance with the previous literatures.

The present study reveals that supernumerary teeth are more common in 21-30 years of age, which is in coincidence with the findings of other authors. According to Salcido-Garcia et al, the appearance of supernumerary teeth is more frequent in the first three decades of life than in older age groups. This observation may be due to the fact that a large percentage of such teeth tend to be a casual finding in the course of third molar extractions conducted in patients in this particular age range. As well as patient at this age are more conscious about their appearance and seek dental treatment for correction of spacing or displaced teeth caused by supernumerary teeth.

Regarding the gender distribution, we coincide with most authors that males are more commonly affected than females. No case with inheritance occurrence was noted in the present study. There are no satisfactory explanations for the mode of inheritance of supernumerary teeth in literature but occasionally a positive family history exists.

In present study, most patients having supernumerary teeth were diagnosed incidentally
either on clinical or radiographic examination. The most common complaints associated with supernumerary teeth are spacing, diastema, displacement, etc. However, some patients also came with typical complain of an extra tooth 7, 8, 9, 25, 28 which is in accordance with previous literatures.

Supernumerary teeth are also commonly found in permanent dentition as compared to mixed and deciduous dentition 6, 25 which is in accordance with present study.

Supernumerary teeth are more common in maxilla than in mandible. In maxilla, premaxillary region is the most common site. Mesiodens was the most common supernumerary teeth followed by paramolar and distomolar. Supernumerary teeth occurring at other sites in the jaws (other than mesiodens, paramolar, distomolar) are more frequently seen in maxilla and are singly present with supplemental shape. 6, 25

The most common shape of supernumerary teeth is conical shape 1, 8, 28, 37 followed by supplemental, tuberculate and rare is molariform shape. 2, 8, 9, 28 A dichotomy of the tooth bud and local hyperactivity in the dental lamina has also been suggested as a possible etiological factor for such findings. 1, 2, 6, 13, 23, 25, 37

Radiographs (in form of IOPA, occlusal and OPG) were taken in all the patients as indicated. Most of the supernumerary teeth in present study were fully erupted and diagnosed clinically only. However, unerupted supernumerary teeth were also present which were diagnosed incidentally on radiographs. Most common unerupted supernumerary tooth was mesiodens which was often in inverted position. 6, 8, 23 OPG was advised in patient with suspected multiple impacted supernumerary teeth. This is supported by the literature that thorough examination for prevalence of supernumerary teeth is through clinical and radiographic examination. 1, 6, 9, 12, 20

In the present study association of supernumerary teeth with dentigerous cyst, 7 complex odontoma and partial anodontia has been found in one patient each. Association of supernumerary teeth with partial anodontia has been reported in literature also. Disturbance in migration, proliferation and differentiation of the neural crest cells and interaction between the epithelial and mesenchymal cells during initiation stage of tooth development has been suspected as possible cause. 3, 6, 17 No patient with cleidocranial dysplasia 31, 32, 33, 34 or Gardner's Syndrome 30 or Cleft lip 35 was found in our study because of the rarity of these conditions and patients with such conditions rarely seek dental treatment as first choice. So this study fell into the category of non-syndromic supernumerary teeth. 8, 9

Various effects like crowding, failure of eruption of adjacent permanent teeth, ectopic eruption, displacement, diastema, root resorption of adjacent teeth, spacing and eruption of teeth into the nasal cavity and antrum are reviewed in the literature. In the present study, various harmful effects like crowding, displacement, diastema, impacted teeth and spacing were recorded. 1, 2, 6, 20, 21, 24

In the present study, supernumerary teeth that caused harmful effects on the surrounding dentition or was patient's chief complain were extracted followed by orthodontic treatment as required. Patients with supernumerary teeth with other associated lesions were treated with the required treatment. 2, 5, 6, 8, 13, 16, 20, 21, 25, 28, 37

CONCLUSION

Based on this study, it can be concluded that supernumerary teeth are one of the common dental anomalies; more commonly seen in maxilla than mandible, males than females, third decade than other decades of life and permanent dentition than deciduous dentition. Most commonly supernumerary teeth are seen in conical shape. Most common effects caused by supernumerary teeth on surrounding dentition include displacement, diastema and spacing. They may occur as isolated dental finding or as part of a syndrome. Detection of supernumerary teeth is best achieved by thorough clinical and radiographic examination. An alert
Naresh Soni et al.: Check The Extras: A Clinico – Radiographic study of Supernumerary Teeth

Clinician should suspect and search for supernumerary teeth when encountered by delayed, ectopic or asymmetric eruption. Early diagnosis of supernumerary teeth minimizes the treatment required and prevents development of associated problems.

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INTRODUCTION:

The pyogenic granuloma (PG) (also known as "Granuloma gravidarum") is a relatively common, tumour like, exuberant tissue response to localized irritation or trauma\(^1\).

Pyogenic granuloma was originally described in 1897 by two French surgeons, Poncet and Dor, who named this lesion “Otyomycosis Hominis”. It was initially considered to be a botryomycotic infection, an infection in horses thought to be transmissible to humans. The term “Pyogenic Granuloma” or “Granuloma Pyogenicum” was first coined by Hartzell in 1904\(^1\). The name pyogenic granuloma was applied based on an identical lesion found on the skin, thought to be caused by pyogenic organisms\(^2\). It is actually a misnomer since the condition is not associated with pus and does not represent a granuloma histologically\(^1\). The actual cause of pyogenic granuloma is unknown but many etiological agents have been proposed-like hormonal imbalance, chronic trauma etc.

Pyogenic granuloma predominantly occurs in second decade of life and is more common in females than males due to vascular effects of female hormones. No racial predilection has been observed. It shows a striking predilection for the gingiva. Extragingivally, it can be seen in areas of frequent trauma such as the lower lip\(^3,4,5\), tongue\(^6\) and palate\(^7,8\). Similar lesion on palate is known as “lobular capillary hemangioma”\(^9\). A case has also been reported extraorally - in nasal cavity following nasal packing\(^10\).

Clinically, oral pyogenic granuloma is a smooth or lobulated, exophytic growth; presenting as small erythematous papules on a pedunculated (or less commonly sessile) base and usually haemorrhagic. The surface may be deep red or reddish purple depending upon its vascularity. Young PGs are highly vascular as they are predominantly composed of hyperplastic granulation tissue with prominent capillary network. Some lesions have a brown cast if haemorrhage has occurred in the tissue. The surface may show ulceration which may be covered by yellow-white fibrinous pseudomembrane\(^6\). If left untreated for a long period of time, the lesion may undergo fibrosis due to decreased vascularity and becomes small, firm with little bleeding tendency. This lesion is called “Fibro-epithelial Polyp”\(^11\). There are no radiographic findings in case of Pyogenic Granuloma.

Two lesions which clinically appear similar to Pyogenic Granuloma are Peripheral Giant Cell Granuloma and Peripheral Ossifying Fibroma. Only histological evaluation can reveal the true
lesion, especially when it is found on gingiva.

Histologically, Pyogenic Granuloma comprises of proliferating endothelial cells, much of which is canalized into a rich vascular network with minimal collagenous support. Polymorphs as well as chronic inflammatory cells often infiltrate throughout the oedematous stroma, with microabscess formation\(^{(12)}\).

An identical lesion with same histological features occurs in association with florid gingivitis and periodontitis. In such cases, it is referred to as “Pregnancy Epulis” or “Pregnancy Tumour”\(^{(12)}\). These lesions show increased prevalence towards the end of pregnancy, and characteristically, shrink following delivery. Lesion does not occur if proper oral hygiene is maintained, indicating that a local cause is also important in formation of the lesion.

Preferred treatment for most of the Pyogenic Granulomas is removal of etiological agent and surgical excision. Other recent treatment modalities tried in recent times includes use of LASERs or Cryosurgical excision and intralesional injection of sclerosing agents\(^{(1)}\). The lesion has a significant potential to recur. Recurrence is most commonly due to incomplete excision, failure to remove irritant or re-injury\(^{(13)}\) and thus long term follow up is necessary.

**CASE REPORT:**

A 87 year old female patient presented with a growth on the lower left posterior edentulous region since 15 days. The growth was of negligible size when she first noticed it, but then it rapidly grew to attain the current size. Patient did not recall any history of trauma to the region in the near past. No significant medical and family history was given by the patient. Patient had undergone extraction of teeth under local anaesthesia with last tooth extracted about 1 year ago without any complication.

On intraoral examination; 13, 14, 15, 22, 23, 24, 25 were the teeth present. An exophytic, pedunculated growth was present on the lower left edentulous ridge measuring 4 cm X 1 cm in size, extending from 33 upto 37 region anteroposteriorly and from the crest of the alveolar ridge to the depth of lingual as well as buccal vestibules supero-inferiorly (figure - 1).

The surface was irregular, lobulated and showing interspersed ulcerated and normal appearing areas. On palpation, it was soft in consistency, rough, non-tender and easily bled on touch and manipulation. IOPA of the region revealed no bony changes (figure - 2).

From the above clinical findings, a provisional diagnosis of 'Pyogenic Granuloma' was made with 'Peripheral Giant cell Granuloma' kept as possible differential diagnosis. Also, considering such an age of the patient, and the rapidity of the growth, carcinoma was also considered as one of the
differential diagnosis and hence, excision with a wide margin was done and tissue was submitted for histopathology.

Histopathological evaluation showed connective tissue consisting of vast number of endothelium lined vascular spaces filled with RBCs, extravasated RBCs, collagen fibre bundles, fibroblasts and intense infiltration of lymphocytes and plasma cells. The histopathology confirmed the diagnosis of Pyogenic Granuloma (figure-3 and 4). On follow up after 7 days, absolutely uneventful healing was observed.

Since Pyogenic Granuloma has a reportedly high recurrence rate, the patient is still under follow up. 3 months follow-up photograph shows no signs of recurrence. (figure - 5)

DISCUSSION:

Pyogenic Granuloma (PG) in oral cavity is a reactive lesion of the mucosa in response to local irritant or infection of a low virulence which may act as irritant. It should be emphasized that, certain infective organisms have been identified in causation of other vascular lesions-like B. Henselaea (Peliosis Hepatis), B. Quintana (Bacillary Angiomatosis) and HHV8 (Kaposi's Sarcoma and Angiolymphoid Hyperplasia) but no such association has been seen in case of Pyogenic Granuloma. In this case, oral hygiene of the patient appeared to be good. Thus, it appears to be a case of unknown origin.

The growth is typically seen in young adults, although it may occur at any age. This is due to hormonal changes occurring during puberty which causes exuberant response to a local irritant of small intensity. A case of Pyogenic Granuloma has been reported in as early as an 8 week old infant but no case has been found in literature in such an old age as was in this case. For that same reason, wide excision was done keeping in mind differential diagnosis of squamous cell carcinoma.

PG has a positive female predilection (about 1:1.5) as in the present case. Females are far more susceptible than males because of the hormonal changes that occur in women during puberty, pregnancy and menopause.
The disease can occur at any site. Most common site of occurrence though, is gingiva (around 75% of cases) especially close to gingival margin, suggesting that plaque and calculus, food debris and overhanging margins of the restorations are important irritants that may have a role in development of the lesion, other sites being lips, tongue, buccal mucosa. Lesions are more common on facial than lingual surface and can occur involving both the sides including interdental papilla. In this case, lesion appeared on the residual alveolar ridge and extended on both the surfaces of the ridge.

Clinically, the lesion appears as small, pedunculated or sessile, painless, soft with smooth, lobulated or warty surface which is highly friable. Generally lesion grows slowly and reaches its peak by few weeks to months and then remains the same thereafter indefinitely. Some PGs may grow rapidly also. Lesions often ulcerate and bleed profusely even without provocation. PG in present case also had a characteristic appearance in accordance with the literature.

Lesion closely identical to pyogenic granuloma is Peripheral Giant Cell Granuloma and Peripheral Ossifying Fibroma when they occur on the gingiva. If 100 biopsies of pyogenic granuloma appearing lesions of the gingiva are submitted for histologic examination, approximately 85% will be pyogenic granulomas, 10% will be peripheral ossifying fibromas, and 5% will be peripheral giant cell granulomas. Peripheral Ossifying Fibroma is a reactive lesion that occurs exclusively on gingiva and clinically appears as pale pink to cherry red growth typically located in the interdental region and commonly encountered during pregnancy. Peripheral giant cell granuloma is also a reactive lesion predominantly affecting children and showing giant cells histologically. Gingiva is the second most common site for occurrence of oral soft tissue metastasis of malignancy and may be the first sign of malignancy at a distant site. Clinically, metastatic lesions also appear similar to PGs and thus microscopic examination is a must. In current case, microscopic examination ruled out any malignancy and confirmed the diagnosis of Pyogenic Granuloma.

CONCLUSION:

Oral pyogenic granulomas are well documented in literature in young age but its occurrence in old age is uncommon. So when it occurs in an old age, wide excision with the histopathological evaluation is must to rule out malignancy.

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ABSTRACT

Introduction: One of the main causes of permanent tooth loss is attributed to dental trauma; however root fractures are relatively uncommon in these situations. This case report presents the endodontic management of a horizontally fractured maxillary right lateral incisor using extracoronal splint for initial stabilization and then an intraradicular splinting technique for permanent stabilization. Case Report: Patient complained of pain and mobility of the upper right front teeth since 5 hours. After clinical and radiographic examination, a diagnosis of a horizontal fracture of maxillary right lateral incisor at the level of cervical line (Ellis class III) was made. The fracture segments were stabilized using extracoronal fiber splint and final intraradicular stabilization involved placing a fiber post in the canal and luting with resin cement. Discussion: This case demonstrates that both extracoronal and intraradicular splinting techniques together can be used to manage horizontally fractured teeth. The recent advances in the resin-based restorative materials with tooth colored fiber post are of choice because of several advantages such as esthetics, bonding to tooth structure, and low modulus elasticity similar to that of dentin.

KEYWORDS: Fiber splint, extracoronal splinting, Fiber post, intraradicular splinting, mid-root fracture, resin cement.

INTRODUCTION:

One of the main causes of anterior permanent tooth loss is dental trauma. Upper central incisors are vulnerable to this type of injury, being affected in 80% of dental trauma, followed by upper lateral incisors and lower incisors. Incidence of horizontal root fractures ranges from 0.5% to 7% in permanent teeth and from 2% to 4% in primary teeth for all traumatic dental injuries. A single tooth fracture occurs in most cases and multiple teeth fracture is a rare finding.

The success of the treatment of a root fracture depends on many factors like pulpal status and level of fracture. Complication in the healing of the root fracture is because of damage to the dental tissues including pulp, dentin, periodontal ligament, cementum and sometimes the alveolar bone.

This case report presents the endodontic management of a horizontally fractured right lateral incisor at the cervical third of the root, using extracoronal splint for initial stabilization and then an intraradicular splinting technique for permanent stabilization of the fracture fragments of the tooth.

CASE REPORT

A 25 year old male patient reported to the Department of Conservative Dentistry and Endodontics with chief complaint of pain and mobility of the upper right front teeth since 5 hours. History revealed trauma because of the blow of a mechanical tool. Pain aggravated on consuming food and also on consumption of hot or cold beverages. Patient gave non contributory medical history.

On intraoral examination, soft tissue examination revealed bleeding gingiva with respect to maxillary right lateral incisor. Upper lip was found to be inflamed and lacerated due to trauma on right side. Hard tissue examination revealed grade I mobility in relation to maxillary right lateral incisor. The tooth was tender on horizontal and vertical percussion.

Intraoral periapical radiograph of maxillary right lateral incisor revealed a radiolucent horizontal line near the cervical third of the root of the right lateral incisor. Based on the clinical and radiographic findings, a diagnosis of horizontal

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fracture of the root at the level of cervical line (Ellis class III) was made. As the fracture line was subgingival, though the fractured fragment was mobile; it was held in position by the soft tissues.

**PROCEDURE**

As the trauma was recent, single sitting root canal treatment was planned for the patient. Local anaesthesia (Lignocaine) was administered and access opening was made. Holding the tooth in position by light digital pressure radiographic working length determination was done using number 15 K file (Mani) (Fig 3).

File was kept in position to approximate the fracture segments (Fig 4), right central incisor, right lateral incisor and right canine were splinted using extracoronal fiber splint (Angelus), bonded on the middle third of the labial surface of the three teeth using flowable light cure composite (3M ESPE) (Fig 5). After splinting, cleaning and shaping was done using Hand Protaper file system to a master apical size of F2. Obturation was done using F2 cone and AH Plus sealer (Dentsply) (Fig 6). The access cavity was sealed with temporary restorative material (Orafil, Prevest).

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**Fig 1:** Preoperative clinical photographs (labial and palatal aspect) of maxillary right lateral incisor.

**Fig 2:** Preoperative radiograph of maxillary right lateral incisor.

**Fig 3:** Working length determination radiograph.
Patient was then recalled after 3 days for endodontic post placement. Gutta percha filling was removed with peeso reamer by retaining 9 mm of gutta-percha apically. Minimum postspace preparation was done to minimize trauma to the periodontium during the procedure and a radiograph was taken for confirmation (Fig 7). Then a fiber post (Parapost system, Coltene) was tried in the tooth and another radiograph was taken, thus confirming the post in prepared canal (Fig 8).

The post was cemented into the canal using self adhesive resin cement (Rely X U 200, 3M ESPE). Excess cement was removed from the access cavity and the cement was cured for 40s. A radiograph was taken to confirm the post placement (Fig 9). The access cavity was restored with composite resin.

**Discussion**

Preservation of the natural dentition and rehabilitation of oral cavity to a normal functional
state is the primary goal in dentistry. Direct trauma caused by automobile accident, sporting activity, violence, or malocclusion on the jaw or on individual tooth may result in tooth fractures. Initial treatment of horizontal root fracture involves repositioning the fractured tooth segments and then stabilizing the tooth to allow healing of the periodontal ligament.

The treatment of transverse root fracture may be accomplished by means of extracoronal splinting, endodontic treatment of the coronal root fragment, intraradicular splinting of the two fragments using fiber post or extraction of the apical fragment depending upon the site of fracture.

Various extracoronal splinting techniques available for splinting of fracture fragments are orthodontic band-arch wire splint, cap splint, proximal bonding with composite, bonded orthodontic wire, bonding with fiber splint. According to a study conducted by Andreasen et al, extracoronal fiber splint was found to be optimal splint as compared with other splinting techniques. This splint was found to be slightly flexible (semirigid immobilization) and application implies minimal damage to the injured tooth. Hence in the present case, for initial stabilization of the fracture fragments, fiber splint was advocated.

A progressive improvement in the field of adhesive dentistry allows clinician to reattach a broken tooth structure mechanically, chemically and esthetically. In the present case, a fiber post was used along with the resin cement as an intraradicular splint to reattach the coronal fragment. Several advantages of fiber post for reattachment are conservation of tooth structure, esthetics, bonding to the tooth structure, cost effective, functional rehabilitation. Luting agents such as zinc phosphate, zinc polycarboxylate, glass ionomer, and filled and unfilled resin cements have been investigate extensively. However the use of various types of fiber-reinforced post and resin cements is becoming popular.

CONCLUSION

Reattachment of tooth fragment is a variable technique that restores function and esthetics with a very conservative approach. Adhesive techniques, sometimes in conjunction with intra-canal retention, like a post, can be used to reattach fractured segments and an esthetic result can be obtained, preserving the natural tooth with minimum procedure and cost to the patient.

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ABSTRACT

Bisphosphonates (BPs) have been widely used in medical practice as anti-resorptive agents owing to their anti-osteoclastic action. These compounds are also used for their analgesic action and their potential anti-tumor effect. Patients treated with BPs develop osteonecrosis of jaw or maxillary bone after minor local trauma labeled as bisphosphonate related osteonecrosis of jaw (BRONJ). The etiopathogenic mechanism of this pathological condition is poorly understood. In the present case report, a case with follow up of left maxillary osteomyelitis due to BPs is presented.

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INTRODUCTION:

Bisphosphonates (BPs) are a class of drugs derived from pyrophosphates, endogenous inorganic regulators of mineralization, by substituting the oxygen atom in the basic pyrophosphate chain with a carbon, this leads to osteoclast inhibition. Historically, bisphosphonates date back to the middle of the 19th century, where their use was mainly industrial. Their biological characteristics were first reported in 1968. In the early 1990s bisphosphonates were employed as a diagnostic agent in various disorders of bone and calcium metabolism. Currently oral bisphosphonates are used widely in the treatment of osteoporosis. Intravenous regimes are designed to treat the complications of metastatic disease and primary osteolytic pathology of bone.

Bisphosphonates appear to express their effects at three levels: tissue, cell and molecular. Two broad theories have been articulated to explain the pathogenesis in BRONJ. One is bisphosphonate induced osteoclast induced inhibition and other is its antiangiogenic mechanism. The effects of BPs include the reduction of bone loss and the risk of pathological fracture; these drugs are thus administered to patients suffering from destructive bone lesions resulting from osteoclast-induced resorption; they are mainly used to treat and prevent malignant hypercalcemia, skeletal related events associated with bone metastases secondary to solid cancer, and in the management of the lesions of multiple myeloma, Pagets disease, primary and secondary hyperparathyroidism and osteoporosis.

IV bisphosphonates are primarily used and effective in treatment and management of cancer-related conditions. These include hypercalcemia of malignancy, skeletal related events associated with bone metastases in the context of solid tumors such as breast cancer, prostate cancer, lung cancer, and in the management of lytic lesions in the setting of multiple myeloma. IV bisphosphonates are effective in preventing and reducing hypercalcemia, stabilizing bone pathology and preventing fractures in the context of skeletal involvement. While they have not been shown to improve cancer specific survival, they have had significant impact on the quality of life for patients with advanced cancer that involves skeletal system.

Bisphosphonates are thought to concentrate in the jaws due to the associated physiology of this part of the skeleton. The greater degree of vascularization and the daily remodeling that occurs around the periodontal ligament of the teeth. In addition the chronic nature of invasive dental disease, and the treatment it requires occurs in a location where adjacent bone is minimally protected by a thin mucosal covering. This serves to explain why bisphosphonates related osteonecrosis (ON).
manifest itself mostly in the jaws and not other sites of skeleton. Bisphosphonate related osteonecrosis of the jaw (BRONJ) adversely affects the quality of life and produces significant morbidity in afflicted patients. In this case report, we describe a case of BRONJ in left maxillary region.

**CASE REPORT:**

A 76 year old male reported to department of oral and maxillofacial surgery with complain of pain and pus discharge in upper left front and back region of upper jaw since two and half months. Patient gives history of pain and pus discharge in upper left front and back region (22-27) since three months following which he underwent extraction of teeth, but pus discharge and pain continued following extraction. Patient had past history of prostate cancer surgery twice (2004 & 2007) and angioplasty in 2004. Patient has been taking anti-hypertensives, oral bisphophonates (alendronate), calcium tablets since 2007. Intraoral examination showed exposed necrotic bone of 4.5 * 3 cm in 25, 26, 27 region with inflamed surrounding mucosa. (Fig 1)

CT scan of maxilla showed generalized cortical thinning, irregular and patchy osteolysis, osteolytic pattern involving left maxillary arch and floor of left maxillary sinus. Left maxillary sinus was completely opacified with soft tissue. Sequestrectomy and saucerisation (Fig 2 & 3) was done along with extraction of 21, 22, 23, 28 followed by primary closure (Fig 4).
Histopathology report showed granulation tissue, large number of extravasated red blood cells, chronic inflammatory cells and dead bone with empty lacunae in H & E stained section (Fig 5). Postoperatively patient was rehabilitated by obturator (Fig 6).

**DISCUSSION:**

Bisphosphonates are stable analogs of pyrophosphates, which are naturally occurring modulators of bone metabolism. They are potent inhibitors of osteoclast – mediated bone resorption and have cytotoxic effects on mature osteoclasts and inhibit the formation of osteoclasts from precursors. Hence they are used as antiresorptive medicines to maintain or increase bone density and strength in diseases like osteoporosis, hypercalcemia, Paget's disease, bone metastasis, multiple myeloma, primary hyperparathyroidism, osteogenesis imperfecta, and numerous other conditions that feature bone fragility. Bisphosphonates can be given by oral or IV administration. IV bisphosphonates are used extensively to treat osteolytic bone lesions related to multiple myeloma, and bone metastasis of solid cancers, breast cancer or prostate cancer. An increased risk of osteonecrosis in the jaw bones is noted since 2003, causing large and therapy resistant bone exposures of the maxilla and mandible in patients with a history of bisphosphonate administered orally or by IV route. Marked inhibition of bone resorption is seen, particularly when administered by IV infusion.

The exact origin of BRONJ is not known but many hypothesis seem to explain the pathogenesis under as:

- On bone remodeling: it is noted that bisphosphonate causes bone remodeling suppression. The jaw bones have high rate of remodeling than other bones hence rapid remodeling of jaw and suppression of remodeling leads to osteonecrosis.

- On osteocytes: in normal bone osteocytes at the end of their life cycle are removed and replaced with new ones. This process will be absent when bone remodeling is suppressed by bisphosphonates. Healthy osteocytes have canaliculi by which they communicate with adjacent osteocytes as well as exchange nutrients through blood supply. So, once the osteocytes, die the nutrition is also cut off leading to necrosis of bone. It is also noted bisphosphonates attached to the bone act as cytotoxic agents to the osteocytes thereby leading to their death and later their necrosis.

- On antiangiogenesis: bisphosphonate have antiangiogenic property as they suppress capillary regeneration, epithelial growth factor and angiogenesis. The normal healing mechanism in
jaw bone following extraction or invasive dental treatments is disturbed as the blood clot will not form due to angiosuppression by bisphosphonate. Bone remodeling is also inhibited as osteoclasts are suppressed by bisphosphonates leading to delay in wound healing process and BRONJ ultimately.\(^5\)

In order to standardize the criteria for BRONJ the American Association of Oral and Maxillofacial Surgeons (AAOMS) in 2007 has come up with three following criteria:\(^6\)

- Current or previous treatment with bisphosphonate
- Exposed, necrotic bone in the maxillofacial region that has persisted for more than eight weeks
- No history of radiation therapy to the jaws.\(^5,7\)

The present case report is of 76 year old male who was taking oral bisphosphonates followed by prostate cancer surgery and patient had undergone extraction of teeth in upper left quadrant due to pain and pus discharge. But pain and pus discharge did not subside following extraction. Clinically there was bare necrosed bone in upper left maxillary region. Criteria given by AAOMS in 2007 for BRONJ were present in this case suggesting osteonecrosis post bisphosphonate therapy. Post operatively patient had satisfactory healing with no exposed bone. Patient was kept on follow up for six months. Healing after six months was satisfactory (Fig 7). Opening present in buccal vestibule was closed by means of an obturator.

**CONCLUSION:**

Bisphosphonate related osteonecrosis of the jaws is a clinical and pathological entity that is not yet fully understood; the true incidence of this adverse effect is almost certainly underestimated.\(^1\) Although the definitive role of bisphosphonates remains to be elucidated, the alteration in bone metabolism together with surgical insult or trauma appear to be key factors in the development of osteonecrosis.\(^4\)

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A Case Report

PRECISION ATTACHMENT: A CONNECTING LINK BETWEEN FIXED & REMOVABLE PROSTHESIS: A CASE REPORT

Nayan Sapra*, Darshana Shah**, Chirag Chauhan***, Ankit Narola****

ABSTRACT

Satisfactory restoration in a patient with a partially edentulous situation can be challenging especially when unilateral or bilateral posterior segment of teeth is missing. Successful restoration can be done with various conventional and contemporary treatment options. One such treatment modality is precision attached partial dentures. It provides better retention and esthetics in distal extension cases. This paper describes a case report of a patient with Maxillary and Mandibular Kennedy’s class I mod. II extension edentulous span restored with an attachment retained partial denture having an extra coronal precision attachment (Ceka attachment: Preci-vertix and preci-sagix).

KEYWORDS: Kennedy's classification, Precision attachment, Matrix and Patrix, preci vertix and sagix.

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INTRODUCTION:

From their first introduction to the dental profession, precision attachments have been surrounded by an aura of mystery, implying that great skill is required in their successful use. This has served as a contributing factor in discouraging their general use. From the patient's viewpoint, a precision attachment appliance offers more comfort and security than a corresponding appliance with clasps, with an obvious advantage in esthetic appearance .

By definition, the term precision denotes “the quality or state of being precise”. Precision attachments are sometimes said to be a connecting link between the fixed and removable type of partial dentures because it incorporates features common to both types of construction .

Precision attachments retain and attach a removable bridge or partial denture on natural teeth, vital or nonvital. Some serve as retainers for full dentures (overdenture) where few abutments remain. The main purpose of each precision attachment besides retention is its concealment within or under a restoration as an esthetically better alternative to a visible clasp retainer .

Inherent in the conceptions which have led to the development of precision attachments are two basic objectives . These are:

1. To relate the desired platform to the available tooth support.
2. To distribute as far as possible the load to be thrust on the teeth by the appliance.

In order to achieve these two objectives precision attachments have been constructed into two halves, a matrix and a patrix, the two halves being so arranged that they articulate with one another to form a precise but separable joint. The two halves are also referred to as the male and female parts. The abutment retainers houses a slot (female portion) which fits, (embraces or envelops) the male portion .

PROSTHETIC REHABILITATION

• DIAGNOSTIC PHASE

A 43 year old female patient, reported to the department of Prosthodontics, Ahmadabad Dental College & Hospital; complaining of missing teeth. Intraoral examination revealed missing 14, 15, 24, 25, 26 teeth in Maxillary arch and missing 31, 34, 35, 36, 41, 44, 45, 46, 47 teeth in Mandibular arch (Fig 1).
Patient had faulty restoration in lower anterior teeth. Patient was not willing for removable prosthesis. Implant supported prosthesis was ruled out due to financial reasons as well as long duration of treatment for the same. Hence, extra coronal bilateral precision attachments, Preci-sagix in Maxillary arch and Preci-vertex in Mandibular arch were planned, and patients consent was taken after explaining the details of the treatment.

Diagnostic impressions were taken & diagnostic mounting was done to evaluate current occlusal plane, inter arch space in edentulous areas, occlusal interferences and occlusion. Radiographic evaluation of selected abutment teeth was also done through IOPA.

Planned treatment was PFM (Porcelain fused to metal) joint crowns with precision attachment in 13, 22, 23, 32, 33, 42, and 43 & cast partial denture with precision attachment in 14, 15, 24, 25, 26, 34, 35, 36, 44, 45, 46, 47.

- **TREATMENT PHASE**

Tooth preparation was done following the basic principles in 13, 22, 23, 32, 33, 42 & 43. Gingival retraction was done and final impression was made using two-step technique using Elastomeric impression material. Impressions were poured in dental stone. Wax up of prepared teeth was performed and the articulation spaces and bulkiness were evaluated in order to proceed with optimal positioning of attachments using parallelometer mandrel (Fig 2).

Joint crowns were fabricated with the attachments and the trial of the same was done to check the exact fit of the crowns (Fig 3). Framework was fabricated and jaw relation & final try in was done (Fig 4). Partial denture was acrylised and tried in patient mouth.
Try in of joint PFM crowns with attachment (Fig 3)

Jaw relation and try in (Fig 4)

Final prosthesis (Fig 5)

• MAINTENANCE PHASE

The patient was explained about the usage and maintenance of the prosthesis. Proper follow up schedule was planned at 1st week, 1st month and 2nd month and then every six month to evaluate fit of prosthesis, hygiene, plaque control etc.

DISCUSSION

Precision attachment is a connector consisting of two or more parts. One part is connected to a root, tooth, or implant and the other part to the prosthesis providing a mechanical connection between two. These attachments allowed prosthesis to combine the advantage of fixed and removable restorations.

It was Dr. Herman Chayes who first reported the invention of attachment in the early 20th century. Precision attachment gives a removable prosthesis.
the exceptional feature of improved esthetics, less postoperative adjustments, and improved comfort. It is mostly indicated for long-span edentulous arches, distal extension bases, and nonparallel abutments. There is a wide range of attachments available for use in all manners of restorative procedures, from partial dentures to implant-supported prosthesis. By analyzing study models and x-rays, the clinician can make several important points of determination, each of which will influence final attachment selection\textsuperscript{12, 13}. Apart from improving esthetics and retention of removable partial dentures, the availability of precision attachment has made designing of removable partial dentures more flexible. Various cases with esthetic and retention challenges can be solved with correct selection of attachment.

Thus, unnecessary surgery and cutting of sound tooth for abutment preparation can be avoided in restoring missing teeth. However, precision attachments are not without disadvantages. Most of the attachments are very small and come with many parts to assemble. Construction of such attachment requires skill from dental technicians which cannot be acquired easily and needs training. The parts of the attachment are usually exposed to wear and tear and needed to be replaced over time.

**CONCLUSION**

Removable partial dentures still have a good place as a treatment option for partially edentulous Kennedy's class I and class II conditions. With proper case selection and treatment plan, precision attachment such as CEKA attachments system can be used to improve retention, esthetics, and function of removable partial denture. With the mentioned procedure, allows fabrication of very functional and comfortable prosthetic solution for the long span edentulous extension patient cases. Attachments retention can be monitored and upgraded during time just replacing retentive caps into the framework of dentures for patients comfort and satisfaction.

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