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# Heal Talk

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*From The Desk of Guest Editor....*

Dear Friends & Colleagues,

Greetings and good wishes from New Delhi – India.

As we all know the aging or geriatric population is gradually increasing globally resulting in an increased prevalence of systemic diseases. Changes in intraoral health influences systemic health further. Thus, restoration and improvement of oral health, esthetics and speech are important in the process of rejuvenation to provide an anti-ageing effect, and enable regeneration, not only in the aged people but also in the young population.

Nature created teeth but due to multi factorial reasons teeth cannot be retained permanently and dental implants are the nearest replacement to them or we can call them the tertiary dentition or man made third set of teeth.

Dental implants have been in use in dentistry for about six decades now but the discipline is still progressing very rapidly. Over the years Dental implants have evolved into a predictable treatment modality for replacing the missing teeth and other oral tissues.

Implant dentistry plays a very important role in this aspect. Implant Dentistry is constantly changing with each passing day and new techniques and materials which are being developed and practiced in different parts of the world. With these developments all around the world it is necessary to update your skills and knowledge with the emerging trends to upgrade your implant dentistry practice.

The use of dental implants in India has increased tremendously in last decade and it has become one of the most sought after dental sciences discipline. One needs to be abreast with the latest developments in the field of implant dentistry or else one is left behind in the ever evolving field of oral implantology. Newer implant designs, surfaces, materials, connections and newer surgical and prosthetic protocols need to be learnt and implemented by the implant dentists worldwide.

With the incorporation of digital component or CAD CAM in implant dentistry the discipline has become more predictable with less complications. Faster or immediate restoration which are more lifelike are possible today chair side and/or by lab interface.

No implant specialist can stay away from the learning process. Conferences, symposiums, journals and newsletters are an excellent source of enriching your knowledge and clinical skills and keeping abreast of the latest developments in the field.

On behalf of all implant practitioners in India I would like to congratulate the entire team of Heal Talk journal for spreading and sharing the knowledge of Implant Dentistry among the fellow clinicians.

With Warm Wishes & Regards

**Dr Ajay Sharma**  
BDS, MDS (Prosthodontics)  
Dental Surgeon, Implantologist

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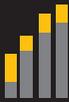
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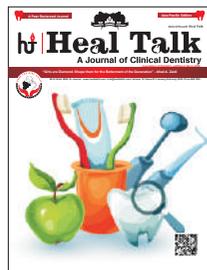
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Selection of Toothpaste:  
Is it Easy Task  
or a Hard Nut to Crack

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- 1 x Restorite Etching Gel (3ml)
- 10 x Microbrush

## Flow Viscous Kit

Light Cure Flowable Viscous  
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**Polymerization shrinkage : 2.8%**

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Shades: A1, A2, A3 & B2

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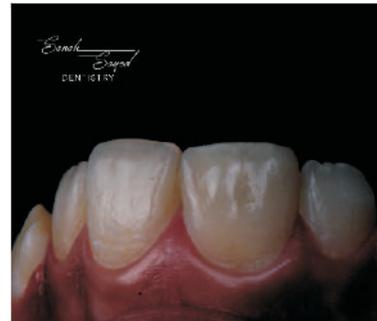
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# Selection of Toothpaste: Is It Easy Task or A Hard Nut To Crack



## Dr Binita Srivastava

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**Q**uestion which very frequently asked by the patients from their Dentist is which toothpaste I should use? Which is the best toothpaste? Specific brand does not make toothpaste best but its composition.

Toothpastes are gel also called dentifrices most commonly used oral care product. Due to competition between manufacturing companies its composition is constantly changing. It is becoming very difficult for patients to choose and more difficult for the dentist to recommend the best. (1) Earlier toothpaste was used only for cleaning teeth but nowadays due to incorporation of many ingredients there are various purpose of using toothpaste such as for preventing caries, gum disease, tooth desensitization, prevent formation of calculus, tooth whitening, suppressing halitosis, remineralization of tooth. (2) Toothpaste contain silica abrasive, humectants, fluoride, buffering agent, water, binders, sudsing agent, flavoring agent, sweetening agent, salt anti-calculus agent, ant plaque agent, coloring agents and pigments. (3)

Agent which is most commonly used in toothpastes is Fluoride, widely used method for delivering fluoride to teeth to prevent caries. The most common forms of fluoride used in toothpaste are sodium fluoride or monofluorophosphate in varying concentration. Increasing the sodium concentration in toothpastes intensify anti-caries effect. The range of fluoride in toothpaste is 500-2800 ppm. There is no fixed dose of fluoride recommended for adult or children because dose response relationship was found. Therefore the choice of fluoridated toothpaste should be balanced against the risk of fluorosis. (4) Effect of fluoride in reducing dental caries is well known but fluoride also affects the type bacteria in dental plaque. Fluoride in dental plaque also reduces the generation of acid from sugar and brings down the number of certain species of bacteria. It is also found

that plaque which is close to fluoride releasing glass ionmer restoration have less number of streptococcus mutans. Streptococcus mutans may also become resistant to fluoride and resistant strains of streptococcus mutans are extracted from patient suffering from xerostomia receiving 1% fluoride gel therapy daily. The amount of fluoride provided by fluoridated dentifrices to dental plaque is very little to bring metabolic conversion in streptococcus mutans and also this require generations to induce the change. We can say that fluoride dentifrices do not alter acidogenicity, fluoride tolerance and composition of plaque. (5)

A prebiotic amino acid called arginine affect the ecology of oral biofilm. The oral ecological homeostasis is maintained by bacteria of the oral cavity associated with biofilm such as *s. gordonii* and *s. sanguis* which breakdown arginine into ornithine, ammonia, carbon dioxide, citrulline and ATP with the help of arginine deiminase system (ADS) and utilize these metabolic by products to for their survival. There are various studies which suggest that supplementation of arginine externally increase the activity of ADS decrease caries. Therefore, arginine is commercially incorporated in toothpaste with sodium fluoride in various concentrations for its anti-caries potential and pH raising effect. It was found that 25 of Arginine Sodium fluoride demonstrated increased antimicrobial effects on cariogenic *s. mutans* along with simultaneous enrichment with *s. gordonii* and *s. sanguis* oral health friendly bacteria. (6) (7) Now a days dentifrices are very convenient method for reducing dentin hypersensitivity. Desensitizing agent used for treating dentinal hypersensitivity include potassium, strontium, stannous fluoride, calcium sodium phosphosilicate and Arginine. Out of all desensitizing agents potassium, stannous fluoride, calcium sodium phosphosilicate and Arginine containing toothpaste for very

## Dr Malvika Panchal Sharma

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effective in reducing dentin hypersensitivity but not strontium containing toothpaste. (8)

Emerging use of toothpaste is for teeth whitening. Teeth whitening toothpaste contain dentifrice abrasives such as dicalcium phosphate dehydrate, calcium carbonate, alumina, perlite, hydrated silica and sodium bicarbonate which play a cosmetic role because of their potential to remove a extrinsic stains and thus contribute in tooth whitening along with oxygenation agent, enzymes and detergents which chemically remove the stains from tooth surface without any physical action. Exposure of tooth to high amount of abrasives of different size and shapes and further exposing to bleaching agents can result in micro-structural damage of tooth structure. Chemical evaluation have also revealed loss of minerals in tooth and reduced concentration of calcium and phosphate. Thus we can say that the tooth whitening dentifrices contain more abrasives when compared to other toothpaste and results in surface roughness of tooth. (9)

Tooth pastes are also used for improving/maintaining gingival health and reducing plaque formation. Toothpaste containing triclosan in presence of zinc citrate or polyvinyl methyl ether maleic acid copolymer have greater anti-gingivitis and anti-plaque activity than toothpaste containing triclosan alone. (10) White spots lesions are very commonly found on teeth, which is a first sign of dental caries is development also called enamel decalcification. If left untreated, these milky white lesions may change into cavitated lesions. These lesions are very common found in teeth of orthodontic patients. Therefore, for treatment of such kinds of lesions there are many types of remineralizing agents such as fluorides, xylitol, casein phosphate amorphous calcium phosphate (CPP-ACP), bioactive glass, self assembling peptides and

tricalcium phosphate. Incorporating remineralizing agents in toothpaste is the non invasive method of treating de-mineralized tooth structure. For re-mineralization of white spot lesions calcium and phosphate ions has not been successful due to its low solubility in presence of fluoride. Additionally, presence of acid is needed for diffusion of calcium and phosphate ions. Soluble Ions of these do not localize at tooth surface due to their very low intrinsic insoluble nature. To overcome all the problems a new remineralizing technology has been developed based on CPP-ACP in which CPP will stabilize the concentration of phosphate and calcium ions along with fluoride ions by binding with pellicle and plaque of tooth surface. As CPP-ACP can stabilize calcium and phosphate in solution, it also help in buffering of plaque pH as a result level of calcium and phosphate in plaque is increased. There are high level of evidences are present on remineralizing ability of CPP-ACP of white spot lesions produced naturally as well as due to orthodontic treatment.(11) Toothpaste containing bio-active glass found superior to CPP-ACP as the deposition of mineral on tooth surface treated with bio-active glass was homogeneous while globules of deposits were observed on tooth surface treated

with CPP-ACP. Bioglass raise the pH of the oral environment also increase number of silica ions which plays a key role in collapsing hydroxyapatite and creating of nucleation sites at de-mineralized tooth surface. It was observed that the toothpaste containing bio-active glass there was a highest increase in the amount of sodium and silica ions and have comparatively higher remeralization potential when compared to other agents (12)

Before deciding the toothpaste it is very important to visit your dentist so that dentist can recommend you the toothpaste according to your oral health and age. It is necessary to consider age also as one of the factor in deciding the toothpaste, especially in case of children less than 5 year due to their possibility of gulping it as it can be toxic. Toothpaste which can be used routinely must contain 2% arginine, sodium fluoride, triclosan with zinc citrate or poly(vinyl methyl ether maleic acid copolymer. Toothpaste with specific oral health condition must be prescribed according to the oral health problem such desensitizing toothpaste, remineralizing toothpaste, toothpaste for gingival /periodontal problem, bacterial load in the oral cavity. Therefore it is very important to choose appropriate toothpaste for oral care.

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Allahabad

Ever find yourself staring at all the colorful boxes of toothpaste on a store shelf wondering which one is best for you? When you're looking for a toothpaste, you'll find they make various claims about cavity protection, gingivitis, plaque, sensitivity, tartar, whitening and breath-freshening. To choose a good toothpaste just concentrate on the toothpaste with at least 1,000 parts per million fluoride and the American Dental Association stamp of approval.



**Dr Amolack Singh Marwaha**

International dental surgeon  
Marwaha dental hospital Tanda umrur  
distt Hoshiarpur Punjab

Selection of tooth paste is hard if you choose by yourself. But if you choose with your dentist's advice this is very easy because use toothpaste according to your tooth health. Different varieties of toothpaste leads to tooth destruction. Do not trust on advertisement. Only trust On your Dentist...



**Dr Archita datta**

Senior resident  
Department of periodontics  
MAIDS

Mint or fruit? Gel or paste ? Fluoride or not? When it comes to choosing a toothpaste, the stores are flooded with many different kinds of toothpaste with different fancy claims. The factors that are crucial on making the best choice are presence of fluoride & specific oral needs (tooth decay, gum diseases, hypersensitivity). Along with the kind of toothpaste you select, proper diet, frequent brushing and flossing, and regular trips to the dentist also play an important role in maintaining your thousand-watt smile.



**Dr. Devendra Chaudhary**

Principal, Prof & HOD Conservative  
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Toothpastes are daily oral care products, the chemical composition of which is constantly changing due to manufacturer's competition. Gel or paste or powder? Fluoride or not? When it comes to choosing a toothpaste, consumers may face a lot of quires/confusions making the decision very tough as store shelves are loaded with a plethora of choices. Each type is marketed to target a specific dental problem or issue and regardless of whether a product is going to whiten teeth or reduce tooth decay, knowing what benefits you personally want can help narrow the toothpaste selection process.



### Dr. Devinder Preet Singh

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#### Selection of a Toothpaste: Is it easy task or a hard nut to crack?

The five common ingredients of a modern toothpaste include sodium fluoride, glycerol, sorbitol, calcium carbonate and sodium lauryl sulfate in varying proportions which form the basic mechanism of tooth cleaning. Nowadays, with the increased popularity of herbal and ayurvedic toothpastes, which have commonly unknown mixture of herbs and shrubs, it has added to one's dilemma of which toothpaste to buy and which to avoid for one particular self. Also, the various companies leave no stone unturned in marketing their products by claiming their toothpastes have different types of mechanism of action on the tooth structures, which instead of making the decision of a layperson of which toothpaste to buy easier, complicates the picture further. The addition of charcoal, salt, clove oil, potassium nitrate and other such active ingredients to make the properties of toothpaste suitable for a particular group of dental patients leads to the flooding of the market with different types of toothpastes with the same brand name. So, it is easy for an individual to get lost in the thought of which toothpaste to buy and it becomes a hard nut to crack for most of us.



### Dr. Gaurav Gupta

Preventive & pediatric dentist  
Consultant  
Wisdom dental clinics, Jaipur



#### Selection A Tooth Paste : Is It Easy Task Or A Hard Nut To Crack ?

Everybody has bacteria in their mouth which live on sugars in the diet. During the day, this bacteria forms plaque on our teeth and gums. Over time, this begins to dissolve the teeth, causing dental decay (holes). At the same time, the bacterial plaque irritates the gums and can lead to gum disease.

Here's what to look for when choosing a toothpaste.

1. Fluoride □ it assists with remineralizing the teeth to reverse & prevent decay.
2. Triclosan □ antibacterial agent that helps to reduce plaque buildup.
3. Whitening □ Mild abrasives help keep teeth clean and prevent staining.
4. Sensitivity □ Sensitive toothpastes are very effective. Some agents work by stopping the nerve from transmitting signals & some by blocking the exposed dentinal tubules. Both works well though.

#### Key Point

Effective brushing and flossing is key – no toothpaste in the world will replace the need for this. Relying on toothpaste or mouthwash to clean your teeth is like slopping a bucket full of soapy water over your muddy car and expecting it to come up shiny.

Choosing a toothbrush is relatively simple: it is recommended brushing with a small headed soft bristled brush, for two minutes, twice a day.



### Dr. Amina Sultan

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Department of pediatric &  
Preventive dentistry  
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#### Selection of Toothpaste: Is it easy task or a hard nut to crack?

We may be bewildered when we come up against such a huge array of toothpastes options on the retail display. While choosing any toothpaste, many of us look for the ingredients, expiration date, additional health benefits, and at times the flavor. Usually most of the tooth pastes have sodium lauryl sulfate or sodium N-lauroyl sarcosinate as a surfactant to help the toothpaste foam up and to emulsify the flavoring agents. It also contains few humectants component such as: glycerol, Xylitol or sorbitol to counter the hardening of the toothpaste after it has been opened for use. Besides, this it also has a solid abrasive like calcium carbonate or silica for removing food debris and polishing teeth. It also has a binding agent, a sweetener and a flavoring agent too. One of the most important ingredients of toothpaste is **Fluoride**, which is a naturally occurring mineral known for its ability to strengthen enamel and prevent cavities. This constituent can be in form of sodium fluoride, sodium monofluorophosphate, or stannous fluoride. Children's toothpaste contains less fluoride than toothpastes for adults due to the hazards of accidental ingestion amongst the kids. Excess fluoride can damage tooth enamel and cause dental fluorosis. Pediatric toothpastes contain less than 600 ppm fluoride. Since the market is been flooded with varieties of tooth pastes and dentifrices and the selection of suitable toothpaste may be tough task for a novice. There may be "all in one" toothpaste containing the combination of agents for tartar reduction, for better gingival health and dental caries prevention and there may be toothpastes for specific oral health concerns. While picking toothpaste, it should be clear what is your primary need or expectations from a tooth paste □ whether you are looking for tartar removal, for teeth whitening, for teeth hypersensitivity or for anti-cavity purposes? At the same time also consider the acceptable flavor of the toothpaste while choosing.<sup>1,2,3,4</sup> Flavors perceived as pleasant during brushing studies have been linked to increased brushing time, which, in turn, can increase the delivery and efficacy of fluoride from toothpastes.<sup>5</sup> Whatever the brand you pick, always choose toothpaste with the American Dental Association (ADA) or Indian dental association (IDA) seal of approval. It is important to verify that the effectiveness of toothpastes has been "clinically proven" by seeking information from dental public health personnel with expertise in the field. Your toothpaste selection is important to your dental health and you should definitely look for certain essential things mentioned above when it comes to your choice of toothpastes. Taking care and being concerned of your oral health is essential for each one of us.

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### Dr. Jasmine Marwaha

MDS (2nd yr)  
(Department of Conservative  
Dentistry & Endodontics)

Selection of toothpaste is easy only when you follow your dentist's advice.

Always look for the ADA Seal on a toothpaste which will make sure you are choosing the best toothpaste. Choose fluoridated toothpaste.

For the best protection, select a toothpaste with at least 1,000 parts per million fluoride. Consider your needs and the needs of your family members while choosing toothpaste...



### Dr. Manish Khatri

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Although it is the action of brushing that primarily helps to combat the bacteria in the mouth that cause dental diseases especially caries and gum diseases.

Using a toothpaste is recommended because its ingredients serve a definite purpose in providing the attributes required by a consumer. For example: Abrasive which helps in removal of plaque and stains and also polishes the tooth surface, Surfactant which helps forming the foam and has a detergent action and a Flavour which makes the product acceptable to use and leaves fresh taste in the mouth. Toothpaste is also an excellent vehicle for delivering different therapeutic agents.

With array of products available in the market, it should be a difficult decision to choose a toothpaste depending upon the ingredients of toothpaste and requirements of an individual, but from practical point of view it is easy for most of the people to choose a toothpaste as the only criteria they look for is flavour.

For the best protection, find a toothpaste with at least 1,000 parts per million fluoride and everything else is a matter of personal preference.



### Dr. Mohammad Jalaluddin

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KIIT DEEMED TO BE UNIVERSITY, Bhubaneswar-751024 Odisha.

Toothpaste approved by ADA should be used. The toothpaste should contain the specific ingredients recommended by ADA, fluoride content, taste and foaming agent (adult & Child respectively) should be the best criteria to judge a toothpaste to be used or not for a layman.



### Dr. Meenakshi Jain

Private Practitioner  
Vasundhara Ghaziabad, UP

Selection of toothpaste might appear a hard nut to crack but it is as easy as to solve 1+1. Just follow the steps below.

1. Check for fluoride presence as it helps prevent tooth decay
  2. Check for triclosan - it helps fight gum disease (gingivitis), reduce plaque, inflammation & bleeding gums
  3. Look for green mark on the lower sealed side of tube. It confirms that toothpaste is made from organic components where as black shows chemically made and blue - partially organic
  4. Do look for ADA seal - American Dental Association which proves that the toothpaste is healthy to use
- Now, you are good to go!



### Dr. Jyotsna Seth

Associate Professor  
Department of Prosthodontics  
Seem Dental College and Hospital Rishikesh

I believe selection of a toothpaste is hard nut to crack as we consumers preferences are changing and becoming highly diversified. There are different toothpastes available in market from the oldest colgate to Anchor so called first vegetarian toothpaste. Even we can see a drastic change in this so called "era of herbal" where everybody is after having natural products than standard or conventional products so still, there is no as such perfect toothpaste in market as still when people I meet the first question they ask "Doc, which toothpaste is the best"!!!!



### Dr. Mayank Singhal

MDS, FILD (laser surgery), MAHA (USA)  
Oral and Maxillofacial Surgeon, Reader,  
Department of oral and maxillofacial surgery,  
Santosh deemed to be University, Ghaziabad

When it comes to choosing the best toothpaste, it's important to think about unique oral health needs.

Barring a few extra 'features', all toothpastes are basically the same. There's really not a lot of difference among different types and brands of toothpaste. As such, we really don't have to put much thinking into what kind of toothpaste brand we should go for. Types of toothpastes available these days, Whitening toothpaste, Sensitivity toothpaste, "Anti-cavity" toothpaste. In a nutshell, while it's a good practice to consult your dentists before buying and "committing" to a particular kind of toothpaste, what we should always remember is that the physical action of brushing your teeth the right way is far more important than the kind of toothpaste you use.



### Dr. Megha Gugnani

PG student  
SGT dental college, Gurgaon

Selection of toothpaste is an easy task but it has been made a hard nut to crack by the TV commercials. Several Pastes like colgate total, pepsodent, close-up etc, are the pastes which are commonly available and are meant to be used for regular brushing in teeth with no signs and symptoms. One of the most common mistake done by people because of the TV commercials is using the sensitivity tooth paste without any check-up or any prescription by a qualified dentist. There are many types of sensitivity toothpastes which can only be differentiated on basis of the condition, signs and symptoms of the teeth of the patient. So, it is better to not make a hard nut to crack and just simply visit a dentist and ask him to prescribe and make your life easy.



### Dr. Pragya Pandey

Assistant Professor  
Department of Conservative Dentistry & Endodontics,  
Faculty of Dental Sciences,  
King Georges Medical University, Lucknow

Selecting toothpaste: Is it easy task or a hard nut to crack? Toothpaste is a daily oral health care product. Today, the market is inundated with a plethora of different kinds of toothpaste each one claiming better than all others. We have a variety of toothpastes like desensitizing, herbal, antiplaque, fluoridated, non-fluoridated, whitening and many other types. Truly speaking, in a bigger scenario, the type of toothpaste does not matter enough to make a difference in your oral health. What matters is the frequency, method and time of tooth brushing. However, in case of a specific problem, like tooth sensitivity or gum bleeding, one should select toothpaste only on the dentist's recommendation. I hope it is now easy for you to choose your toothpaste. Just do correct and regular brushing with any standard paste and enjoy good oral hygiene!!!





### Dr. Priya Singh

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There are few tips based on which the selection of a tooth paste becomes easier.

1. The utmost requirement of a toothpaste is protection, so find a toothpaste with at least 1000 parts per million of fluoride
2. Second most important reason to pick the toothpaste should be a ISO certification and validation by ADA. Apart from these two important requisite rest all are as per patient preference and based on their presenting complaints.
3. For sensitivity there are over the counter (OTC) sensitive toothpaste as well as medicated toothpaste prescribed by dentist. Both of them works well, however OTC pastes comparatively are cheaper but better to use them as per instructions given by the dentist.
4. If concern is aesthetics than usually consumer looks for teeth whitening toothpaste however if used for long can lead to sensitivity and thus should be used as per dentist instructions.
5. For pediatric patient main concern is flavor and attractive color and the fluoride content.



### Dr. Shanam Kansil

Periodontologist  
Landmark Hospital, Chandigarh

Selecting of a toothpaste: Is it easy task or a hard nut to crack? Daily brushing and flossing is essential to maintain the dental health of the patient but an adjunct such as a toothpaste can have an additive effect in the same. The right toothpaste can play an important role in oral health but for a common man it could be difficult to chose which paste is best. Various factors which the individuals can keep in mind while chosing a toothpaste are: the fluoride content should be optimum; the toothpaste should have FDA approved seal; and most important factor is that one should chose toothpaste based on their particular needs and preferences i.e whitening of teeth, teeth sensitivity, tartar control, paste for children etc. Although chosing a toothpaste may seem like a simple task but using the right one will contribute to one's oral health.



### Dr Vipul Srivastava

Endodontist and Conservative Dentist,  
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32 Pearls Multispeciality Dental Clinic, Lucknow.

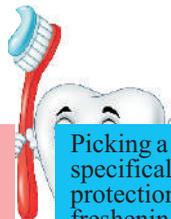
Toothpaste selection should entirely be based on the need as well as the age of an individual. There are also some organic or herbal toothpastes, whitening gels and sensitivity and fluoride containing ones available in market. The best person to help in this selection is your dental expert team as they will guide you which is best for your personal need.



### Dr. Rohan Gupta

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Several studies indicates that brushing without toothpaste but for sufficient time is equally efficient in removing food debris & plaque. Also the natural bristles produces a charge when used alone that makes the tooth surface slippery for bacteria and plaque. so, we may advocate this technique in economically weaker sections to promote brushing habit for good oral hygiene.



### Dr Sanah Sayed

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Founder, 'Sanah Sayed Dentistry'



Product Marketing is a huge contributor to the existing confusion in the modern consumer's mind. Tooth pastes are no different, some of them promise results that makes the patient believe that a visit to the dentist isn't required and they can self-medicate! The guidelines to selecting a toothpaste are fairly straight forward: most importantly it should have anti caries action guaranteed by Fluoride release over a period of time. Using a paste over a gel is also advisable since gels have higher Abrasive content and could wear out enamel over a period of time. Bleaching pastes could contain chemicals or abrasives which are not advisable to be used without a professional overlooking. Sensitivity pastes could take care of an aging dentition provided there are no cavities leading to the same otherwise. Herbal pastes have their short coming as well. In a nutshell, any paste that is IDA approved and contains Fluoride can be used for maintaining the oral hygiene. Combine this with a soft toothbrush and the correct Brushing technique with 6 monthly dentist visit and your good to go!

### Dr. Sumit Bhateja

Head  
Dept of Oral Medicine & Radiology  
Manav Rachna Dental College, Faridabad



### Selecting a Toothpaste – An easy task or hard nut to crack! – A review

It's difficult deciding between the 50+ toothpastes available in market. However it can be quite an easy task if one keeps in mind the important ingredients before selecting a toothpaste.

#### Fluoride

The most important ingredient in toothpaste is fluoride. Common forms of fluoride in toothpaste are sodium fluoride, sodium monofluorophosphate and stannous fluoride. Fluoride assists with remineralising (strengthening) the teeth to reverse and prevent decay.

#### Triclosan

Triclosan is another common ingredient in toothpaste. It's a well-proven antibacterial agent that helps to reduce plaque buildup and therefore helps protect against decay and gum disease.

#### Whitening

Whitening toothpastes work primarily by increasing the abrasiveness of the product. Abrasives such as phosphates (calcium pyrophosphate), carbonates (calcium carbonate), silica compounds or aluminium compounds.

#### Sensitivity

Some people experience tooth sensitivity, especially to cold foods and drinks. The most common cause is when part of the root is exposed through gum recession. Active ingredients includes potassium nitrate and potassium citrate, strontium, arginine and calcium sodium phosphosilicate

### Dr. Zahoor Akbar

(Dental Surgeon)  
Chief Consultant Dental Essence Dental Clinic  
Tilak Nagar New Delhi.  
Associate Dentist  
Best Care Dental Clinic Palam New Delhi.



Picking a toothpaste is not a matter availability or trend you have to be specifically particular about your priorities and oral cavity need cavity protection, gingivitis, plaque, sensitivity, tartar, whitening and breath freshening.

“For the best protection, find a toothpaste with at least 1,000 parts per million fluoride and the Ada Stamp approval.

i can add the color coding criteria which is really helpful for choosing a good toothpaste but i will exceed the word limits.



### ✚ Is it mandatory to do RCT in teeth which is to be used as abutments for bridge?

RCT is not mandatory for teeth to be used as abutments for a bridge. However, in some cases where correction of an angulation is required (like in severe proclined teeth), or if the abutment tooth size is too small (to provide structural durability and esthetics) or in cases of severely tilted teeth (to be corrected by telescopic coping) RCT can be performed to enhance the results.

### ✚ Why in our country dentists prefer making acrylic RPDs and not tooth tissue supported RPDs?

The lack of access to specialist (prosthodontic) services and inadequate laboratory support in addition to greater cost than the acrylic RPD prosthesis, make the cast framework RPDs a less preferred treatment modality.

### ✚ What are the advantages and disadvantages of one piece and two piece dental implants?

#### One piece: advantages

1. Used in Narrow spaces
2. No microgap at implant fixture and abutment junction, hence less bacterial contamination
3. No second stage surgery
4. No marginal bone loss as is associated with second stage surgery
5. Needs immediate loading – beneficial to patient
6. Increased strength due to unified structure of implant and abutment. This is especially beneficial when using smaller diameter implants to restore an edentulous space limited by bone volume or interdental space.
7. Less components are used (reduced need for inventory of abutments, impression copings, implant analogues)
8. No loosening or fracture of the abutment screw (healing abutment or prosthetic abutment)

#### One piece Disadvantages:

1. Reduced prosthetic flexibility: angulation can be modified only by reduction and cannot be used if severe angulation correction (>15 degree) is required. Also there is no zirconia abutment available yet. Bone loss can result in unesthetic metal margin.
2. Usually limited to anterior narrow spaces
3. Because the prosthetic component, or abutment, is connected

to the implant body, the implant MUST be provisionalized at the time of surgery. Initial implant stability above 25 Ncm must be achieved since there is no option to bury the implant and allow 3-5 months for osseointegration to occur.

#### Two piece : Advantages

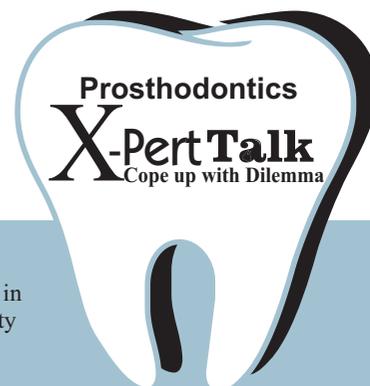
1. Prosthetic flexibility : availability of wide range of abutments indicated for different situations
2. Immediate loading is not mandatory but optional and situation based.

#### Two piece :Disadvantages:

1. A second stage surgery in submerged approach is involved leads to marginal bone loss
2. Microgap between implant and abutment is associated with microbial colonization at fixture abutment interface. This in turn is associated with inflammation and increased alveolar bone loss.
3. Limited use in narrow bone sites due to mechanical challenge as the diameter of the conventional two piece implant approaches 3.00mm and less the implant body becomes structurally weak to accommodate the connecting screw or the screw remains thin which lead to repeated screw breakage.
4. Mechanically less favorable due to loosening or fracture of abutment screw.

### ✚ What are the different methods for correct placement of implants?

Use of surgical guides and performatting guided surgery is undoubtedly the most predictable way of surgical placement of implants in the correct position.



#### Dear Reader

Heal Talk is Running this column (X-Pert Talk) for the benefit of dental fraternity. Now X-Pert Talk is a regular column in Heal Talk. All your queries related to Prosthodontics will be answered by the innovative & widely read dental personality Prof. (Dr.) Mahesh Verma. I request you to email your questions on [healtalknews@gmail.com](mailto:healtalknews@gmail.com)

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## Endodontic Treatment in Elderly Patients (Part II)



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1<sup>st</sup> Vice President, Indian Dental Association, H.O.

Professor, Subharti Dental College, Meerut (U.P.)

### Systemic factors

Elderly patients are likely to develop one or more systemic conditions. Certain degenerative conditions may lead to loss of fine motor control. Patients with Parkinson's disease suffer from tremors and bradykinesia, and they may have difficulty remaining stable during the course of the treatment. It is recommended to use mouth props to ensure comfortable jaw opening during long procedures.

The incidence of Xerostomia is common in people above the age of 65. Xerostomia and hyposalivation lead to increased rates of caries. The salivary dysfunction could be an age-related change or be related to some systemic conditions or use of certain medications. Many medications are known to cause hyposalivation.

Patients suffering from disorders of the bone like osteoporosis, bone metastases etc. are on Bisphosphonate based medications. A bisphosphonate related osteonecrosis of the jaw (BRONJ) following dental extractions could be a possibility. While recording the history of the patient, leading questions about the consumption of bisphosphonates should be included in the records. Whilst the overall incidence is low, the consequences of BRONJ are disastrous. It may be beneficial to retain these compromised teeth if possible in patients taking bisphosphonate medications and consider extractions only if absolutely necessary to avoid possible complications. In cases where the teeth are severely compromised, endodontic treatment and root capping should be considered, which can eliminate infection and avoid the complications related to extractions.

### Cardiac devices

The number of patients having pacemakers and other electrical cardiac devices being implanted, the incidence has increased over the period of time. Pacemakers and implantable defibrillators are devices that regulate cardiac rate and rhythm. Both are susceptible to electromagnetic interference. Electronic apex locators are required to be used in patients undergoing endodontic treatment and rely on an electric current to determine the canal length. Several case reports have been published outlining the successful use of electronic apex locators in patients with implanted cardiac devices with no harm to the patient. The apex locators have not been found to influence the function of the devices. However, because the canals are much narrower, this approach requires additional time, effort, and care to prepare the root canal and reduce the risk of binding and separation. Since there is a limited evidence that electronic apex locators significantly affect pacemaker function, the manufacturer recommend, to avoid use of electronic apex locators in patients with implanted cardiac devices. It is in the interest of the clinician to use other methods of working length determination in these patients.

### Clinical outcome

The aims of endodontic treatment are the same regardless of patient age – eliminate bacteria from the root canal system, prevent reinfection and create an environment that will promote healing of apical periodontitis. On the review of the literature, one in vitro study found that older dentine was more difficult to disinfect than young dentine, whereas one systematic review found no effect of age on the outcome of primary endodontic treatment. A more recent prospective study observed a trend towards greater healing in the elderly. Patient age alone should not be considered as a prognostic factor.

If the canals are identified calcified radiographically, the clinician should locate the canals with proper magnification; prepare the canals with stiff, pre-curved stainless steel hand K files size 6, 8 and 10, followed by glide path files like DFinders with lubricant and copious irrigation. After preparing adequate the glide path the canal instrumentation should be completed with a single taper NiTi file system like Silk, which are flexible and less prone to fracture. The use of a single cone with bioceramic sealers is a good option for obturation in these patients.

The use of posts in these restoration of endodontically treated teeth is entirely the decision of the clinician since the excessive taper can cause vertical root fracture.

It would be expected that vital pulp therapy would probably have a lower success rate due to reduced pulpal cellularity in the elderly. One of the studies reported that patients over the age of 40 had significantly worse outcomes following direct pulp capping than younger patients. However, on systematic review of the literature, it has been recorded that teeth have been successfully treated with vital pulp therapy in patients up to the age of 70. Therefore, the vital pulp therapy for elderly patients should be considered as a treatment option, if possible.

### Conclusions

People are living longer and keeping their teeth longer. Root canal treatment in elderly patients has a significant role in comprehensive dental care due to the increased presence of an “aging society.” Despite changes to the pulpo-dental complex, endodontic treatment is a predictable and effective means of maintaining the dentition. The clinician must keep in mind the aged patient's emotional and physical needs to ensure that treatment is as comfortable as possible.

The elderly patients with complex conditions and problems require special care and advanced training is required to carry out root canal treatment in this group of patients. There is a need to improve education programs and curriculum to include training regarding suitable dental care procedures for this branch of dentistry.

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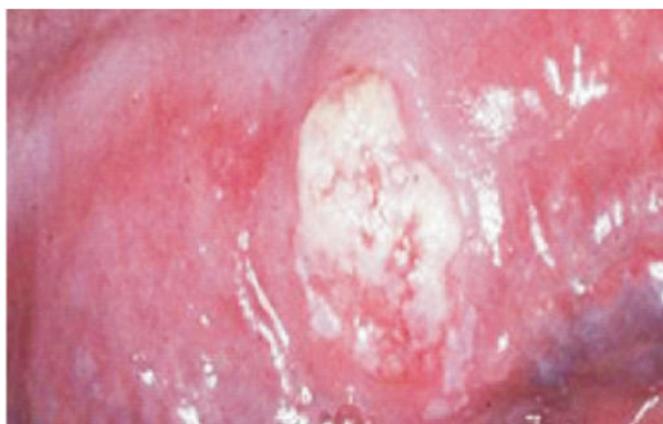


## Epidemiology of Oral leukoplakia

### Prof. Shadab Mohammad

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PFA, AO Fellow, WHO Fellow, MNAMS  
Dean Faculty of Dental Sciences, Prof & Head Department of OMFS  
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Oral premalignancy is classified into two broad categories, premalignant lesions and premalignant conditions. The premalignant lesion is defined as “a morphologically reformed tissue in which oral cancer is more likely to occur than in its seemingly normal counterpart.” For example leukoplakia. A premalignant condition is defined as “a generalized state associated with a significantly increased risk of cancer.” For example oral submucous fibrosis. Oral leukoplakia is a potentially malignant disorder affecting the oral mucosa. Oral leukoplakia is a white patch that develops in the oral cavity and is strongly associated with all forms of tobacco use, chronic irritation, fungal infections, sexually transmitted lesions like syphilis, micronutrient deficiency etc.



The epidemiology of Leukoplakia is well documented. On the basis of literature we find the prevalence of leukoplakia varies. It has a prevalence of 2.6% and a malignancy conversion rate ranging from 0.1% to 17.5%. [1] The statistical analysis from several studies conducted in India, in particular, concluded the prevalence of leukoplakia ranging from 0.2% to 5.2% and the malignant transformation of 0.13% to 10%. [1] The increase in the prevalence rate of the disease in India could be mainly due to its cultural, ethnic, and geographic factors. Downer and Petti found an annual malignant conversion incidence rate between 6.2 and 29.1 cases per 100,000 population.[2]

Martorell Calatayud et al. found the prevalence to be 0.4% to 0.7%, whereas Feller et al. recorded the prevalence of 0.5% to 3.46%. This shows that the malignant transformation rate of leukoplakia ranged from 0.7% to 2.9%.

Brouns et al. found the annual malignant transformation rate of about 2% and 1%, respectively.[1] In mostly conducted studies leukoplakia was evident in 1.59% of the study sample.[2]

Leukoplakia is more common in middle-aged and elderly males than in other age. As the age progresses the disease also increase.

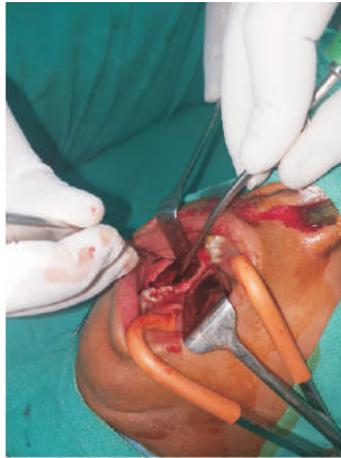
Leukoplakia usually doesn't cause permanent damage to tissues in your mouth. But leukoplakia increases risk of development of oral cancer. Oral cancers often form near leukoplakia patches, and the patches themselves may show cancerous changes. Even after leukoplakia patches are removed, then also there is a risk of malignant transformation.

When a lesion is found and treated early, then it can be managed successfully. But for it Regular checkups are important, for inspecting your infected areas of mouth. The disease is best managed by otolaryngologist, dentist and a pathologist. The aim is to educate the masses and eliminate all contributing factors. The patient must be motivated to quit tobacco. The doctor should emphasize to the patient that the lesions can recur, and malignant transformation is a possibility.

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Enucleation of large dentigerous cyst from Right posterior region of mandible along with impacted 3rd molar under General anesthesia



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# Post-Traumatic Trigeminal Neuropathic Pain Management: Is Surgery Sufficient?

Dr. Ranju Yadav<sup>1</sup>, Dr. P. P. Bhandari<sup>2</sup>

## Abstract

When the non-surgical methods to permanently resolve neuropathic pain involving the lip, chin, or tongue following inferior alveolar and/or lingual nerve injury are not effective, then microsurgery of these nerves has been a recommended modality. The recurrence of neuropathic pain after trigeminal microsurgery is likely multifactorial and might not depend on factors that normally affect useful or functional sensory recovery in those who have no neuropathic pain. These results indicate that the understanding of post-traumatic trigeminal neuropathic pain is incomplete. Predictive outcomes of treatment will probably improve when the etiology is better defined to allow mechanistic or target-/site-specific treatment. Until then, non-surgical treatment for post-traumatic trigeminal neuropathic pain remains a safer option. Risk factors have been identified for patients developing chronic post-surgical pain due to post-traumatic neuropathy. These include psychological, medical, and age related factors. The best management may lie in preoperative screening and avoidance of elective surgery for high risk patients as the prevention of post-traumatic trigeminal neuropathic pain in the absence of effective medical or surgical interventions.

**Keywords:** neuropathy, microsurgery, botulinum, transaction

## Introduction

Neuropathic pain can occur as a result of peripheral nerve injury and presents as allodynia, hyperpathia, hyperalgesia, and sympathetic mediated characteristic pain reactivity in and around the dermatome affected when a sensory or mixed nerve is injured. Modern microneurosurgeons espouse that motor, sensory and mixed functional recovery in crushed, partially transected and completely transected peripheral nerves occur when proper techniques are employed to reconnect healthy proximal and distal nerve endings dependent, in part, upon age, duration, location and type of nerve injury. The inferior alveolar nerve (IAN) carries general sensation for the mouth, teeth, lip and chin and the lingual nerve (LN) carries general and special sensation (taste) for the anterior two-thirds of tongue. Both are branches of the third division of the trigeminal nerve and serve important function for oral health and general functions such as eating, chewing, tasting, and phonation.

The incidence of injury to either of these nerve by elective dental or oral and maxillofacial surgical procedures ranges from 0.6% to 90%<sup>1,2,3</sup>. The most common cause of injury, in order, is third molar extraction, reconstructive mandibular surgery, mandibular trauma, dental injection, dental implant placement, dental endodontic therapy, or the consequence of pathology of the oral cavity or surgery for pathology of the oral cavity<sup>4,5</sup>. The most common outcome of nerve injury is the loss of general sense or general and special sense of the lip/chin/tongue depending upon which nerve is injured.

The loss of general sensation of the lip and chin can be measured by clinical testing<sup>6</sup> and the degree of injury can be visualized by special imaging, magnetic resonance neurography<sup>7</sup>. The loss of general sensation and taste capability of the anterior tongue can also be measured by clinical testing and videography<sup>6,8</sup> and the degree of injury can be visualized by special imaging, magnetic resonance neurography<sup>7</sup>. The majority of injured IAN and LN recover spontaneously but spontaneous recovery depends upon the modality and the severity of the injury (compression, partial or complete transection) that would or would not support neurotization of injured axons<sup>9,10,11,12,13,14,15,16</sup>. Based on time from injury, degree of nerve injury, location and age of the patient, surgical reconnection of the injured nerve or decompression results in functional or useful sensory recovery in general sensation in upto 90% of patients

## Clinical Presentation

The patient with iatrogenic post-traumatic trigeminal neuropathy may present with anesthesia, hypoesthesia or hyperesthesia, all with attendant functional problems and

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resultant psychological sequelae. The issues specific to trigeminal pain include the complexity of the region, the problematic impact on daily function and significant psychological impact<sup>17</sup>.

The trigeminal nerve is the largest sensory nerve in the head and neck, protecting the essential organs that underpin our very existence (brain, eyes, nose, and mouth). It is no wonder that pain within the trigeminal system in the face is often overwhelming and inescapable for the affected individual. Of the injured trigeminal nerves, the incidence of developing post-traumatic trigeminal neuropathic pain has been reported to range from 0.45% to 70%<sup>19,20</sup> of injuries involving IAN and LN. Clinical presentation of post traumatic trigeminal neuropathy is similar to other sensory nerves; however, due to the anatomical location the functional and psychological impact is greater than most other nerve injuries<sup>21</sup>. Most studies purely report mechanosensory presentation; however, a more holistic approach for assessing the patients with trigeminal nerve injury is recommended<sup>18</sup>. There are 3 features of posttraumatic trigeminal neuropathy worthy of assessment. They are pain discomfort, functional implications, and psychological abnormalities<sup>18, 22</sup>. Neuropathic pain is commonly experienced by 50-70% of patients as either spontaneous on going pain, which is often a burning characteristic, a spontaneous shooting, or electric shock like sensation (neuralgia). Patients also experience stimulus induced pain due touch or cold often having difficulties with daily function, such as kissing, socializing, speech, eating and drinking. Consequently, patients were often anxious, tearful and had psychological repercussions and demonstrated personality trait disorder.

## Trigeminal Neuropathic Pain

The neuromechanism that cause post-traumatic trigeminal neuropathic pain of the IAN and LN are still unknown. Significant phenotypic differences exist between individuals who have neuropathic pain versus those who do not after trigeminal nerve injuries. Age at the time of injury, the duration of time from injury to repair, the degree of nerve injury, and location/subtype of nerve (IAN>LN) may predict onset. Treatment includes microsurgery for trigeminal injuries as it does for non-trigeminal nerve injuries.

However, at least for trigeminal, there does not appear to be a predictable benefit of surgery for neuropathic pain relief that exists for patients without neuropathic pain. There is no phenotypic marker that predicts relief or reduction. We can only assume that until there is a recognized neuromechanism for the onset of neuropathic pain in the sensory system will there be a reliable base for surgical intervention or a surgical intervention that is site specific and effective. Until then, microsurgery has only chance benefit.

## Management

Generally a holistic approach is required based on pain, functional and psychological problems that the patient is suffering from. The iatrogenic nature of these injuries and their subsequent chronic pain lays a heavy psychological burden at the patient's door. Hence the need for psychological interventions through the patient's post-operative journey is essential, and evidence base is emerging<sup>21</sup>. The surgical and medical management will depend on the mechanism and the duration of the nerve injury and the patient's complaints. There may be limited window to maximize IAN injury resolution in relation to dental implants, endodontics, and third molar induced injuries. A report suggested that early removal of implant (within 30 hours) may maximize neuropathy resolution; however, the evidence remains weak<sup>23</sup>. The pharmacologic therapies for acute trigeminal injuries include the use of corticosteroids and non-steroidal anti-inflammatories<sup>24,25</sup>. Late phase pharmacologic management includes using topical local anesthetics, anticonvulsants for stimulus or spontaneous pain, tricyclic antidepressants or serotonin reuptake inhibitors for constant or elicited burning pain<sup>26,27</sup>. Botulinum toxin injections for focal neuropathic pain have limited success and facial palsy is a poorly tolerated side effect<sup>31</sup>. Alternative pain management strategies are also proving effective for trigeminal neuropathic pain including TENS, acupuncture, low level laser therapies<sup>29,30,31</sup>.

## Summary

Clinical trials of post-traumatic trigeminal neuropathic pain have pointed out that phenotypic differences exist between individuals who have neuropathic pain before microsurgery of the damaged trigeminal nerve versus those who not. Microsurgery has benefit for improving general sense and special sense in the trigeminal nerves but has only chance effect on neuropathic pain. Until actual neuromechanics or target-/site-specific causing neuropathic pain are identified, peripheral microneurosurgical intervention of the trigeminal nerves is questionable treatment. A recent Cochrane Systematic review of the interventions for post-traumatic trigeminal neuropathy due to dental surgery concluded that there is clearly a need for randomized controlled clinical trials to determine the effectiveness of surgical, medical, and psychological interventions for iatrogenic IAN and LN injuries<sup>32</sup>.

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# A Link Between Occlusal Trauma & Periodontitis

Dr. Mohd Rehan<sup>1</sup>, Dr. Manish Khatri<sup>2</sup>, Dr. Mohd. Faizi<sup>3</sup>

## Abstract

The role of occlusion in periodontics has been a controversial issue for many years. The emphasize should be given on the role of trauma from occlusion in periodontal tissues, which is essential to determine its impact on prognosis and treatment plan of clinical cases.

## Introduction

The role of occlusal trauma in the initiation and progression remains a controversial subject in periodontology.

## Definitions

### Occlusal Trauma:

An injury to the attachment apparatus as a result of excessive occlusal force<sup>1</sup>

#### 1) Primary Occlusal Trauma:

Injury resulting from excessive occlusal forces applied to a tooth or teeth with normal support.

#### 2) Secondary Occlusal Trauma:

Injury resulting from normal occlusal forces applied to a tooth or teeth with inadequate support.

#### 3) Combined Occlusal Trauma:

Injury from an excessive occlusal force on a diseased periodontium.<sup>2</sup>

### Traumatogenic Occlusion:

Any occlusion that produces forces that causes an injury to the attachment apparatus.<sup>3</sup>

## Classification

1. **Acute Trauma:** Results from an abrupt occlusal impact such as biting on a hard object.

2. **Chronic Trauma:** develops from gradual changes in occlusion produce by tooth wear, drifting movement or parafunctional habits.

3. **Primary Trauma:** It is a tissue reaction, which is elicited around a tooth with normal periodontium. Such as high filling

4. **Secondary Trauma:** Tissue reaction in which occlusal forces cause damage in a periodontium of reduced height.

5. **Combined Trauma:** It is the injury that occurs to the periodontium resulting from abnormal occlusal forces that are applied to a tooth or teeth with abnormal periodontal support.

## Related Theories:

**A. Theory of Codestruction (GLICKMAN)**<sup>4</sup> explain the relationship between occlusion and periodontal disease. He described two regions in the periodontium: the zone of irritation (marginal and interdental gingiva and gingival and transeptal fibers) and the zone of codestruction (periodontal ligament, alveolar bone, cementum, transeptal and alveolar crest fibres). The plaque induced gingival inflammation was confined to the zone of irritation. Occlusal forces or traumatogenic occlusion affected the zone of codestruction but did not cause gingival inflammation.<sup>5</sup>

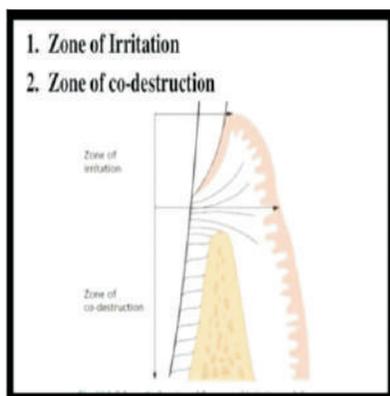


Figure No.1

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**B. Waerhaug**<sup>6</sup> proposed that there was no proof that occlusal trauma caused or acted as a cofactor in the formation of angular defects. He believed that infrabony pockets were associated with the advancing “plaque front” or apical growth of subgingival plaque and the formation of either horizontal or angular bone defects were dependent on the width of the interproximal bone.<sup>7</sup>

## Stages of Tissue Response to Occlusal Forces-

### \* Stage-1: Injury

- Slightly excessive pressure and tension.
- Increased pressure and tension
- Severe tension.

### \* Stage-2: Repair

- Central buttressing
- Peripheral buttressing

### \* Stage-3: Adaptive Remodelling.

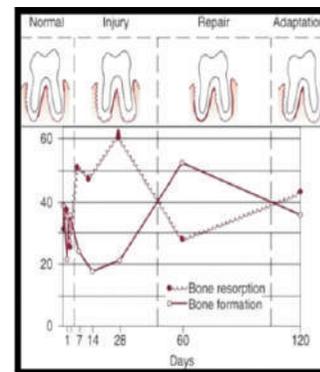


Figure No.2

## Clinical Signs & Symptoms:<sup>8</sup>

### 1) Progressive Mobility

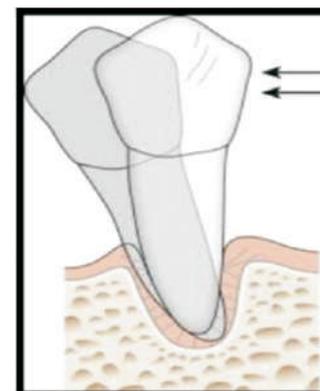


Figure No.3

- 2) Pain on chewing or percussion
- 3) Fremitus
- 4) Occlusal prematurities/discrepancies
- 5) Wear facets in the presence of other clinical indicators

- 6) Tooth migration
- 7) Chipped or fractured tooth
- 8) Thermal sensitivity

### Radiographic Features

- 1) Widened PDL space
- 2) Bone loss (Furcations; vertical; circumferential)
- 3) Root resorption

### Treatment Considerations:<sup>9</sup>

- 1) Occlusal adjustment
- 2) Management of parafunctional habits
- 3) Temporary, provisional or long-term stabilization of mobile teeth with removable or fixed appliances
- 4) Orthodontic tooth movement
- 5) Occlusal reconstruction
- 6) Extraction of selected teeth

### \* Occlusal Adjustments-

Occlusal adjustment or selective grinding is defined as reshaping the occluding surfaces of teeth by grinding to create harmonious contact relationships between the upper and lower teeth.<sup>10</sup>

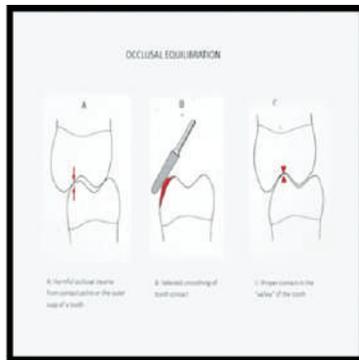


Figure No.4

### i) Indications

- 1) To reduce traumatic forces to teeth that exhibit Increasing mobility or fremitus to encourage repair within the periodontal attachment apparatus.
- 2) To achieve functional relationships and masticatory efficiency in conjunction with restorative treatment, orthodontic, orthognathic surgery or jaw trauma
- 3) Reduce the damage from parafunctional habits.
- 4) To reshape teeth contributing to soft tissue injury.



Figure No.5

### ii) Contraindications

- 1) Occlusal adjustment without careful pre-treatment study, documentation, and patient education.
- 2) Prophylactic adjustment without evidence of the signs and symptoms of occlusal trauma.

- 3) As the primary treatment of microbial-induced inflammatory periodontal disease.
- 4) Treatment of bruxism based on a patient history without evidence of damage, pathosis, or pain.
- 5) Instances of severe extrusion, mobility or malpositioning of teeth that would not respond to occlusal adjustment alone.

### \* Splinting

#### • Indications

- 1) Stabilize teeth with increasing mobility that have not responded to occlusal adjustment and periodontal treatment.
- 2) Stabilize teeth with advanced mobility
- 3) Facilitate treatment of extremely mobile teeth by splinting them prior to periodontal instrumentation and occlusal adjustment procedures.
- 4) Prevent tipping or drifting of teeth and extrusion of unopposed teeth.
- 5) Stabilize teeth, when indicated, following orthodontic movement.
- 6) Splint teeth so that a root can be removed and the crown retained in its place.

#### • Contraindications

- 1) When the treatment of inflammatory periodontal disease has not been addressed.
- 2) When occlusal adjustment to reduce trauma and /or interferences has not been previously addressed.
- 3) When the sole objective of splinting is to reduce tooth mobility following the removal of the splint.

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# Oral Manifestations Due to Nutritional Deficiencies & Systemic Diseases : A Review

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## Abstract

Relationship between nutrition and oral health is multifaceted. Nutrient deficiency may result in oral symptomatology. Nutrition has both local and systemic impacts on the oral cavity. There are many factors which affects the nutrition as age, sex, and pregnancy. Clinical manifestations of nutrient deficiencies can have a significant impact on the function of the oral cavity. Functional properties of the oral cavity include taste, salivation, mastication, and swallowing food. The mouth is frequently the mirror of the body involved in conditions that affect the skin or other multiorgan diseases. In many instances, oral involvement precedes the appearance of other symptoms or lesions at other locations. Dentists and health professionals must recognize the manifestations of these deficiencies consider their causes and provide early treatment to prevent further compromise in nutrition status and to promote optimal nutrition, oral and overall health.

**Keyword:** Nutrition, manifestations, vitamins, nutrient deficiencies, symptoms, dental caries, Periodontal diseases, Hypogeusia,

## Introduction

Nutritional science investigates the metabolic and physiological responses of the body to diet. These compounds provide that needs both energy and essential molecules for growth and maintenance.

Nutrients are the constituents of food necessary to sustain the normal functions of the body. The sequences of biochemical steps through which substances in living things change from one form to another. With advances in the fields of molecular biology, biochemistry, and genetics, the study of nutrition is increasingly concerned with metabolism and metabolic pathways. The human body contains chemical compounds, such as water, carbohydrates (sugar, starch, and fiber), amino acids (in proteins), fatty acids (in lipids), and nucleic acids (DNA and RNA). These compounds in turn consist of elements such as carbon, hydrogen, oxygen, nitrogen, phosphorus, calcium, iron, zinc, magnesium, manganese, and so on. All of these chemical compounds and elements occur in various forms and combinations (e.g. hormones, vitamins, phospholipids, and hydroxyapatite).

### Factors that Influence the Amount of a Nutrient Required to Meet the Needs:

- 1. Age:** The nutrients vary from infancy to adulthood. For example, adults required about 0.8g of protein per kg of body, whereas infants need over 2g per kg.
- 2. Sex:** For men are approximately 20% greater than those for women
- 3. Other Factors:** For most nutrients are increased about 20 – 30 % above normal in pregnant and lactation women. Patients with injury or illness also show increased requirements for some nutrients.

The relationship between nutrition and oral health is multifaceted. Nutrition has both local and systemic impacts on the oral cavity (1). While diet and eating patterns have a local effect on the teeth, saliva and soft tissues, nutrition also has considerable implications and it gave a good assessment as a component of comprehensive care due to the systemic impact. Nutrients is essential to the growth, development, and maintenance of tissues, effectiveness of the immune system, prevention of cell damage and, in general, to increased resistance to many chronic, and some infectious diseases (1,2). The oral cavity is often one of the first sites where nutrient deficiencies can be clinically noted.

Nutrient deficiencies can have a clinical manifestations and a significant impact on the function of the oral cavity. The function

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of oral cavity include taste, salivation, mastication, and swallowing food. Any alterations in the structure and function of the oral cavity may compromise intake and contribute to the development of a nutrient-deficiency state.

### Development of Nutrient Deficiencies

The oral cavity is a mirror of the body and have important anatomical location with a role in many physiologic processes, such as digestion, respiration, and speech. The mouth is frequently involved in conditions that affect the skin or other multi-organ diseases. In many instances, oral involvement precedes the appearance of other symptoms or lesions at other locations. An imbalance of supply and demand of nutrient will lead to deficiencies, that is meaning, inadequate to meet the demands of the body (3).

Oral tissues, such as the gingiva (gums), bone, teeth, and muscles of mastication (chewing muscles), are living tissues, and they have the same nutritional requirements as any other living tissue in the body. A poor diet can have defect impact on health, causing deficiency diseases such as scurvy, health-threatening conditions like obesity and metabolic syndrome, and such common chronic systemic diseases as diabetes, osteoporosis, and cardiovascular disease (4).

Nutrient stores may be not reflect in serum levels. If body stores are depleted, biologic and physiologic performance and cell functions became altered dependent on the specific nutrient (5).

### Diet & Nutrition Play a Key Role in

- \* Tooth development.
- \* Gingival and oral tissue integrity.
- \* Bone strength.
- \* Prevention and management of diseases of the oral cavity

The medical history and presenting symptoms with examination is important to detecting deficiency conditions and possible causes. Any diseases can increase nutrient consumed and

thereby leading to a deficiency. Infections in the oral cavity due to bacteria and fungus may alter tissue integrity, increase nutrient utilization.

Inadequate intake may be due to functional difficulties such as poor dentition, tooth loss, xerostomia, and systemic disease, as well as socioeconomic problems, anorexia, and depression, also prolonged poor dietary intake due to ill-fitting dentures and difficulties with mastication has been shown to result in inadequate intake of zinc, calcium, and B6 (6).

Effects of nutrient deficiencies on tooth development as dental caries:

Teeth are made from protein matrix that is mineralized with collagen (requiring vitamin C), calcium, and phosphorus to form a hydroxyapatite (requiring vitamins D and A).

The decay process was happened by plaque formation, sticky mix of microorganisms, protein, polysaccharides, and bacteria metabolizing fermentable carbohydrate produce acid. Acid production oral pH<5.5 allows tooth demineralization. So gradual demineralization of enamel; proteolytic destruction of tooth structure as calcium and phosphorus, can be affected any tooth surface.

*Streptococcus mutans*-most common bacteria involved fermentable carbohydrate. While protein foods, eggs, fish, meat and poultry; most vegetables, fats, sugarless gums, do not contribute to decay do not cause a drop in salivary pH.

### Malnutrition & Periodontal Disease

Periodontal diseases, a group of infectious diseases which are mostly chronic, affect the supporting tissues of the teeth. Malnutrition may make the periodontium more susceptible to infectious organisms because compromised host defense responses toward the oral flora. The stage of the infection related to varying degrees in malnourished individuals(7, 8). This could result in a greater amount of periodontal destruction, leading to a compromised dentition.

Periodontal (gum) diseases, including gingivitis and periodontitis, are serious infections that, left untreated, can lead to tooth loss, which can affect one tooth or many teeth. Nutritional deficiencies (notably vitamin C and folate) can alter the disease process, periodontal diseases are not caused by these deficiencies nor can they be cured by nutrient supplementation alone(9,10). There are multiple causes of gingivitis including: chronic diseases such as diabetes; medications including phenytoin and calcium channel blockers, also some drugs, such as oral contraceptives, anti-depressants, and certain heart medicines, pregnancy, tobacco users also are at increased risk for periodontal disease, research proves that up to 30% of the population may be genetically susceptible to gum disease, there are certain times in a woman's life when extra care is needed—times when mature and change such as puberty or menopause, during these particular times, a woman's body experiences hormonal changes that can affect many of the tissues in body, including the gums, gums can become sensitive, and at times react strongly to the hormonal fluctuations. Also many serious conditions such as hypertension, cancer, and numerous other health problems, also is a risk factor for periodontal disease. Spongy, red, bleeding and painful gingiva is also noted in scurvy, an advanced vitamin C deficiency disease. In severe gingivitis, the easy bleeding and soreness of the gingiva may make eating difficult and contribute to poor intake. Soft, nonirritating, temperate and mildly flavored foods and fluids should be provided to meet energy and nutrient needs. Vitamin A

deficiency (11) was cited as a cause of periodontal disease, folate deficiency that a deficiency of this vitamin is the cause of gingivitis.

### Oral Cavity Defect Due to Nutrient Deficiencies

Nutrient deficiencies may causes abnormal color, topography, size and sensations

in the oral cavity (12), other abnormal findings such as glossopyrosis (painful and burning tongue and soft tissue), dysgeusia (altered taste), angular cheilitis (painful, dry cracked corners of the mouth). Abnormal findings may reflect oral manifestations of a many systemic diseases, medications, disorders to the oral cavity, or a nutrient deficiency (13).

### The Effect of Tooth Loss & Dentures

Tooth loss may affect ability to chew, relationship between loss of teeth and reduced intake of fruits and vegetables. Dentures are often ill-fitting (especially common after weight loss); problem foods included fresh fruits and vegetables, chewy and crusty breads and chewy meat like steak, saliva production decreases reduced chewing ability, lower calorie and nutrient intake occurs for many simple nutrition. Older, edentulous (having no teeth) patients who have had a stroke with the accompanying chewing and swallowing problems may be at significant nutritional risk, particularly if they are living alone and on a limited income.

### Altered Taste

Hypogeusia, or diminished taste, is noted in zinc deficiency. Other non-deficiency state causes of altered taste include radiation to the head and neck, diabetes mellitus, and Sjögren's syndrome. Taste should be conducted to determine which taste sensations remain.

### Changes in the Tongue

There are several changes that can occur on the tongue during nutrient deficiency states.

A painful, magenta colored, atrophic, smooth tongue is noted during a riboflavin deficiency. Glossitis may also be evidence of a vitamin B6, folate or B12 deficiency. However, during a chronic folate deficiency, the tongue papillae will become atrophied, resulting in a shiny, smooth surface appearance. Glossitis with loss of filiform papillae may also be seen in individuals with iron-deficiency anemia. A niacin deficiency results in a raw beefy, bright red, swollen, and painful tongue. Glossodynia may also be present in diabetes, resulting in painful mastication and swallowing.

### Angular Stomatitis & Cheilosis

Stomatitis; inflammation of oral mucosa. Angular stomatitis (painful fissures at the corners of the mouth) and cheilosis (dry scaling of the lips and corners of the mouth) are common findings in riboflavin deficiency. Similar findings may be noted with niacin and B6 deficiency states. The similarity of these findings may be due to riboflavin's role in B6 and tryptophan (which is converted to niacin) metabolism. Angular stomatitis, however, may be associated with iron deficiency anemia (14). Angular cheilitis, however, is often associated with fungal infections, lip-sucking, and dehydration (15).

### Oral Manifestations of Systemic Diseases in Relation to Nutrient Deficiencies:

#### Diabetes Mellitus:

Diabetes mellitus is a systemic disease associated with delayed wound healing and oral manifestations which may alter nutrient intake and so effected the nutrition status. Poorly controlled diabetes mellitus is associated with glossodynia, xerostomia, candidiasis, gingivitis,

periodontitis and altered taste (16, 17, 18). Up to 30% of individuals over the age of 19 with type 1 diabetes have periodontal disease (18). Good oral health important in order for individuals to be able to consume a diet adequate for maintaining glycemic control, in order to restore oral and overall health.

### **Pregnancy & Contraceptive Pill**

The oral mucous membrane, and the gingiva, undergo changes during pregnancy which, from clinical and histological observations, should be termed pregnancy gingival hyperplasia, gingivitis beginning in the second or third month of pregnancy that increases in severity throughout the eighth month. During this time, some women can notice nutrient deficiencies due to swelling, bleeding, redness or tenderness in the gum tissue; and diseases that interfere with the body's immune system may worsen the condition of the gums. The gingival changes observed occasionally in women taking oral contraceptives may also be due to hormonal causes.

### **Renal Disease & Renal Transplant Patients**

Oral manifestation due to nutritional deficiency has significant appearance in related to renal disease. Significant restriction of dietary protein, sodium, potassium, phosphorus and fluid intake is necessitated for management of patients with renal failure. Iron deficiency anemia, osteomalacia, and deficiencies of other water soluble vitamins may occur. Direct consume of drug-induced immunosuppression, or as a result drug pharmacokinetics will lead to different oral problems arise in these patients. Oral health and nutrition status must be monitored in the management of the transplant Patient (19).

The immunosuppressive medications and steroids have oral- and nutrition-related results including impaired glucose tolerance, osteoporosis, osteopenia and defect integrity of the oral cavity soft tissue. Dental appearance including ulcerative stomatitis, xerostomia, gingival hyperplasia (GH), and urea in the saliva can effect the nutritional status and dietary intake. The high simple carbohydrate diet followed by individuals with end-stage renal disease combined with the presence of xerostomia increases risk of tooth decay(20).

### **Gastrointestinal Diseases**

#### **Ulcerative Colitis**

The oral cavity is the portal of entry to the gastrointestinal tract. Lined by stratified squamous epithelium, the tissues of the mouth are often involved, as lesions which manifested in the oral cavity as diffuse labial, gingival, or mucosal swelling, aphthous ulcerations or superficial hemorrhagic ulcers or angular stomatitis occurs in many of patients (21).

#### **Chronic Liver Disease**

Chronic liver disease affects many systems of the body. The coagulation pathway is one such system. The liver synthesizes many of the clotting factors necessary for hemostasis. In patients with advanced liver disease visible in the oral mucosa is jaundice, which is the yellow pigmentation that results from the deposition of bilirubin in the submucosa. In addition, vitamin K, a fat-soluble vitamin, requires proper liver function to be adequately absorbed from the intestines, in liver disease the resultant impaired hemostasis can be manifested in the mouth as petechiae or excessive gingival bleeding with minor trauma, it occurs in the absence of inflammation as a result of the defects of clotting factors (22).

#### **Anemia**

Mucosal conditions, such as glossitis, recurrent aphthae, candidal infections, and angular stomatitis may be more

common in patients with anemia. Glossitis may be the first sign of folate or iron or vitamin B12 deficiency. The tongue appears reddened, and the papillae are atrophic, producing a smooth appearance. Fatigue and decreased resistance to infection are common systemic symptoms. The oral mucosa exhibit pallor. This pallor is a common and easily recognizable feature of anemia.

Angular stomatitis is commonly caused by a candidal infection, and it has been due to iron deficiency (23).

#### **Xerostomia**

Dry mouth(hyposalivation or xerostomia), it may be seen in severe vitamin A deficiency states (12) and in protein calorie malnutrition. The primary causes of xerostomia include medications, Sjögren's syndrome, diabetes mellitus, and radiation to the head and neck (16). Altered taste sensations are frequently reported by individuals with xerostomia (24). Inadequate salivary flow can also contribute to oral infections, including dental caries and glossopyrosis (16, 24), also have difficulty with eating, swallowing, and speech. The former can result in decreased food intake and poor nutrition. The reasons for this vary from medication to medication but can range from dehydration (e.g., with diuretics) to anticholinergic activity (e.g., with some antidepressants).

#### **Under or Low Intake Nutrition & Oral Health**

Under nutrition may produce characteristic signs and symptoms in the oral cavity. The oral diseases associated with vitamin deficiencies are common in emerging "third-world" nations. In these countries, the limited supply of nutrient-dense foods or the lack of specific nutrients in the diet (vitamin C, niacin, etc.) may produce characteristic oral manifestations. In addition, unusual food practices, such as chewing sugar diet throughout the day or other regional or cultural nutritional practices may decrease the oral health of specific populations.

For example, in a typical B vitamin deficiency, a person may complain that the tongue is red and swollen and "burns" ( glossitis ), that changes in taste have occurred, and that cracks have appeared on the lips and at the corners of the mouth (angular cheilosis). In a vitamin C deficiency, petechiae (small, hemorrhaging red spots) may appear in the oral cavity, as well as on other parts of the body, especially after pressure has been exerted on the tissue. In addition, the gums may bleed upon probing with a dental instrument.

In humans, calcium deficiency causes the production of hypoplastic enamel (poorly mineralized enamel) similar to the osteoporosis produced in bone. Teeth appear to have a biological priority over bone when calcium is limited in the diet.

The mouth is frequently the mirror of the body involved in conditions that affect the skin or other multiorgan diseases. In many instances, oral involvement considered the first location of many symptoms or lesions at other parts.

Nutrition risk evaluation was part of the scope of practice of all health professionals; early detection of risk for nutrient deficiencies during medical or dental exams, recognition of oral manifestations of nutrient deficiencies and other diseases (25,26,27). There is a clear relation between oral health and nutrition. Nutrients plays a big role in maintaining the normal function of the oral cavity (27). Nutrient deficiencies will cause oral defect and this alter dietary intake, resulting in deficiency states, malnutrition and poor wound healing following procedures or surgeries.

In our study we were found that many systemic conditions are known to adversely affect the mouth or teeth, and these patients

require additional oral care and management so a dental evaluation should accompany the medical and psychological evaluation of a suspected eating disorder.

The diet of early modern humans varied significantly depending on location and climate. The diet in the tropics tended to be based more heavily on plant foods, while the diet at higher latitudes tended more towards animal products (28).

In our study especially our city due to social behaviors, due to several time war, because of terrorism, low socioeconomic, all this lead to poverty, physical destitution, hunger and lack of healthy food, also because religious reasons our women must cover all the body with black cloths, and wear a veil and sometimes black gloves when they go outdoors. These factors act as a good reason for preventing the people from taking a good healthy foods, so increased in nutritional deficiencies. This issue also was discussed as, they reported that "people of cultures such as Bedouins living in the Nagged Desert, who are required to have most of the skin surface covered by clothing, due to prevent them from exposed to the heavy sun light, are prone to develop vitamin D deficiency".

Inadequate nutrition in the period from conception to approximately 12 years of age can affect the formation of enamel, causing pits and areas of roughness and these can be more susceptible to decay.

Research demonstrates that stress can make it more difficult for the body to fight off infection, including periodontal diseases; a diet which low in important nutrients can compromise the body's immune, already know, tobacco use is linked with many serious illnesses such as cancer, lung disease and heart disease, as well as numerous other health problems.

We've probably heard a few old wives' tales about pregnancy, including "A tooth lost for every child." While it seems far-fetched, it actually is based loosely in fact.

Careful periodontal monitoring and excellent oral hygiene is especially important for women who may be noticing changes in their mouths during times of hormonal fluctuation. To help ensure good oral health,

Women often become anemic during pregnancy because the demand for iron and other vitamins is increased. The mother must increase her production of red blood cells and, in addition, the fetus and placenta need their own supply of iron, which can only be obtained from the mother.

Most people in our society, carbohydrate food is the main meal to fill hunger, as well as the adaptation of fast foods that contain insufficient nutrients, the use of soft drinks and the lack of eating vegetables, fruits and meat and failure to eat food containing vitamins and minerals led to the emergence of sign and symptoms that represent lack of healthy nutrition and affect the health of mouth and teeth.

As mentioned, lifestyle- and obesity-related diseases are becoming increasingly prevalent all around the world. There is little doubt that the increasingly widespread application of some modern food processing technologies has contributed to this development. The food processing industry is a major part of modern economy,

Nutrition is taught in schools in many countries. In England and Wales the Personal and Social Education and Food Technology curricula include nutrition, stressing the importance of a balanced diet. However, statistics collected by the World Health Organization from 1990-2000 show in France may have

been underestimated and, in fact, may be similar to that of neighboring countries(30).

In 1992, The U.S. Department of Agriculture introduced the Food Guide Pyramid. In 2002, a Natural Justice study showed a relation between nutrition and violent behavior. In 2005, a study found that obesity may be caused by adenovirus in addition to bad nutrition(31).

Dietary and physical activity guidelines from the USDA are presented in the concept of a food pyramid, which superseded the Four Food Groups.

The U.S. Department of Health and Human Services provides a sample week-long menu which fulfills the nutritional recommendations of the government (32).

## Conclusion

The dentist must have a good experiences and social communication, and competence and caring for the patients. Improving the awareness of nutritious meal choices and establishing long-term habits of healthy eating have a positive effect on cognitive and spatial memory capacity, potentially increasing a student's potential to process and retain academic information. It is important for physicians to recognize the link between systemic disease and oral findings. Some systemic conditions may first manifest with oral findings and a trained physician may detect and diagnose these conditions earlier, thereby initiating treatment sooner. Patients experiencing this side effect should be monitored and encouraged to maintain good oral hygiene and frequent dental visits.

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Oral Cavity Area	Clinical Manifestation	Nutrient Deficiencies
Lips	Cheilosis, Angular fissures	Niacin, B6, riboflavin, iron
Gingiva	Spongy, bleeding, abnormal redness	Vitamin C
Tongue	Glossitis, (red, raw, fissured), Pale, atrophic smooth/slick (filiform papillary atrophy, Magenta color	Folate, niacin, iron, B6, Iron, folate riboflavin

Table 1: Nutrition Risk Factors to Consider in Clinical Examination

1. Anemia	10. Kidney transplant	19. Soft tissue abnormality
2. Corticosteroids drugs	11. Medication	20. Stress
3. Depression	12. No sun light	21. Starvation
4. Diabetes mellitus	13. No money for eat or low socioeconomic	22. Tooth loss
5. Diet reduced as regime	14. Oral contraceptive pill	23. Tobacco
6. Fungal infection	15. Pregnancy	24. Ulceration in the mouth
7. Genetic or inherited diseases	16. Poor dentition	25. Vascular disease
8. Hormonal changes for puberty or post menopause	17. Radiation therapy	26. Vitamins deficiency
9. Inflammatory bowel disease	18. Renal disease	27. Xerostomia

Table 2: Local and systemic causes of nutritional deficiencies.

Clinical Feature	Associated Finding	Associated Disorder	Nutritional Considerations
Difficulty biting \ chewing food	Partial or total edentulous Lack of occlusion ill-fitting dentures	Bone defect, Abnormal occlusion	Modify diet consistency, Loss of anterior occlusion-modify for difficulty biting, Loss of posterior occlusion -modify for difficulty chewing
Burning of mouth	May be with or without associated erythema edema (stomatitis)	Anemia, Diabetes, Candidiasis	Determine etiology of deficiency, Determine cause of poor glucose control, modify diet, evaluate cariogenicity, evaluate for dysgeusia, dysphagia
Burning of the tongue	Glossitis, Pale, atrophic, smooth tongue	deficiency of iron folate, B6, niacin, and/or riboflavin deficiency of iron folate, B12	Determine etiology; treat with diet & /or supplements as needed. The same above
Angular fissures of mouth (stomatitis) lips	Drug - induced Dry, cracked lips	Niacin, riboflavin, B6, iron deficiency, dehydration,	Determine the etiology.
Xerostomia	Dental caries  Candidiasis  Burning mouth and tongue	Drug - induce Xerostomia  Connective tissue disorder. Diabetes	Push fluids; evaluate cariogenicity of diet, Modify food consistency and choices to reduce pain (limit spicy, hot, acidic, & seasoned foods) Evaluate masticatory efficiency & modify food choices. Evaluate glucose control, modify diet.
Bleeding tendency	May be with or without associated edema	Anemia, Diabetes	evaluate cariogenicity of diet, Modify food consistency and choices to reduce pain. Evaluate masticatory efficiency & modify food choices.
Pain	Dental caries Candidiasis  Burning mouth and tongue	Calcium deficiency, Drug - induce  Connective tissue disorder.	Determine etiology of deficiency, Determine cause of poor glucose control

Table no. 3: Abnormal Oral Findings Associated With Local and Systemic Disease

Nutrient	Effect on tissue	Effect on caries
Protein /calorie malnutrition	Delay tooth eruption Decrease tooth size Decrease enamel solubility Salivary gland dysfunction	Yes
Vitamin D/ calcium/ phosphorus	Lowered plasma calcium level Hypomineralization (hypoplastic defect) Compromised tooth integrity (decrease minerals concentration) Delay eruption pattern.	Yes
Vitamin A	Decrease epithelial tissue develop Tooth morphogenesis dysfunction. Decreased odontoblast differentiation Increased enamel hypoplasia.	Yes
Vitamin C	Dental pulpal alteration Odontoplastic degeneration Aberrant dentine	No
Iron	Slow growth, salivary gland dysfunction	Yes

Table no. 4: Effect of Nutrient Deficiencies on Tooth Development

## Recurrent Aphthous Stomatitis (RAS)

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### Abstract

Recurrent aphthous stomatitis are very common painful mucosal conditions affecting the oral cavity. In spite of their high prevalence, etiology remains unclear. The article outlines the clinical presentation, diagnostic criteria, and current trends in the management of recurrent aphthous ulcers.

**Keywords:** RAS, Stress Ulcers, Ulcer Activity Index, Immunomodulation, Diagnostic Criteria.

### Introduction

The term Aphthous means ulceration. Recurrent aphthous stomatitis (RAS) is a common painful oral mucosal condition. The clinical presentation of RAS is small, multiple, round or ovoid ulcers, with circumscribed margins, having yellow or gray floors surrounded by erythematous haloes.<sup>1,2</sup>

### Clinical Presentation

The three different clinical variants of RAS as classified by Stanley in 1972.<sup>3</sup> Minor RAS, Major RAS, Herpetiform  
**A: Minor RAS:** It is also known as Miculiz's aphthae or mild aphthous ulcers. It is the most common form, constituting 80% of RAS. Its Size ranges between 8-10 mm in diameter with a greyish, white pseudomembrane and an erythematous halo. Most common Site is labial mucosa, buccal mucosa, and floor of the mouth. These ulcers heal within 10-15 days without scarring.<sup>3</sup>



Typical minor aphthae (buccal mucosa, 22-year-old male)

**B. Major RAS:** Peradenitis mucosa necrotica recurrens or Sutton's disease. 10-15% of patients are affected. These ulcers exceed 1 cm in diameter. Most common Sites: lips, soft palate, and fauces. Last for about 6 weeks and heal with scarring.<sup>4</sup>



Major aphthae (soft palate and fauces, 32-year-old male)

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**C. Herpetiform:** Characterized by recurrent small, multiple ulcers may be up to 100 in number. Size varies between 2-3 mm in diameter. They Combine to form large irregular ulcers Persist for about 10-14 days. Women are commonly affected than males and have a later age of onset as compared to other clinical variants of RAS.<sup>1,3</sup>



Herpetiform ulcers (tongue, 42-years-old female)

Aphthous ulcers are further divided as:

Simple and Complex Aphthosis

**Simple Aphthosis:** Are few lesions, heal within 1-2 weeks, recur infrequently.

**Complex Aphthosis:** Multiple, Severly painful, of larger size, develop more frequently.

### Predisposing factors

- Genetics
- Trauma
- Drugs
- Tobacco
- Hematinic deficiency
- Gluten sensitive enteropathy/celiac disease.
- SLS containing tooth paste.
- Hormonal changes.
- STRESS
- Micro organisms

### Genetics

A genetic predisposition for the development of aphthous ulcer is strongly

suggested as about 40% of patients have a heredity and these individuals experience ulcers earlier and are of more severe nature.<sup>3</sup> several relations /associations with HLA antigens and RAS have been reported. These associations vary with specific racial and ethnic origins.<sup>4,5</sup>

### Trauma

Trauma to the oral mucosa because of local anesthetic injections, dental treatments, sharp tooth. Wray et al<sup>2</sup>. in 1981 evaluated that mechanical injury may aid in identifying and studying patients prone to aphthous stomatitis.<sup>6</sup>

### Drugs

Include ACE inhibitor captopril, gold salts and sodium hypochloride. NSAIDS such as, diclofenac, propionic acid may also be the cause of oral ulceration which appear like RAS.<sup>7</sup>

### Tobacco

Various studies discovered a negative association between cigarette smoking, smokeless tobacco and RAS. Nicotine is thought to be the protective element as it stimulates the production of adrenal steroids by its action on the hypothalamic adrenal axis and reduces production of (TNF- $\alpha$ ) and interleukins 1 and 6 (IL-1 and IL-6).<sup>8,9,10</sup>

### Hematinic Deficiency

Iron deficiency, vitamin B12, and folic acid predispose development of RAS.

### Gluten sensitive enteropathy/celiac disease, inflammatory bowel disease:

Gluten Sensitive ENTEROPATHY, also known as Celiac Sprue, a malabsorption syndrome has association with RAS. Inflammatory bowel diseases e.g Crohn's disease and ulcerative colitis may present with aphthous-like ulceration.<sup>1,2</sup>

**Sodium lauryl sulfate (SLS)containing toothpaste:** It has been reported that on

Tantray et al.: Recurrent Aphthous Stomatitis (RAS)

using sodium lauryl sulfate containing tooth paste there is an increased frequency in the occurrence of RAS.<sup>2</sup>

### Hormonal Changes

Many conflicting reports exist regarding association of hormonal changes in women and RAU.

However in 1992 McCartan et al.<sup>11</sup> confirmed that there is no association between aphthous stomatitis and premenstrual period, pregnancy, or menopause.

### Stress

It has been emphasized that stress is a causative factor in RAU. Recent study shows lack of interrelation between levels of stress and severity of RAS episodes and revealed that psychological stress may behave as a triggering factor rather than a causative factor in susceptible RAS patients.

### Role of Microorganisms in aphthous ulceration

**RAS and oral streptococci:** It has been evaluated that L form of  $\alpha$ -hemolytic streptococci, *Streptococcus mitis* was the causative factor of this disease. Hoover et al. in 1986<sup>12</sup> discovered that low levels of cross-reactivity of oral Streptococci and oral mucosal antigens and considered the reactivity to be non-specific and clinically insignificant.

**RAS and *Helicobacter pylori*:** *H. pylori* has been implicated as one of the organisms in the etiopathogenesis of RAS.

In 1997 Porter et al.<sup>13</sup> measured the levels of IgG antibodies against *H. pylori* in patients with RAS and concluded that the frequency of anti-*H. pylori* seropositivity was not significantly increased in patients with RAS and other ulcerative and non-ulcerative oral mucosal disorders.

**Viruses as etiologic agents in RAS:** In 1998 Sun et al.<sup>14</sup> discovered the existence of Epstein-barr virus (EBV) genomes in pre-ulcerative oral aphthous tissues in RAU patients by polymerase chain reaction.

Disease	Presentation
Behcet's syndrome	RAU, genital & ocular ulcers
Magic syndrome	Variant of behcets with inflamed cartilage
PFAPA	Periodic fever, apthae, pharyngitis, and cervical adenitis. Seen in young children
Sweet's syndrome/acute febrile neutrophilic dermatosis.	Fever, leukocytosis, skin lesions: dense dermal neutrophilic infiltrate
Cyclic neutropenia	Cyclical neutropenia, Oral ulceration, cutaneous abscess, URTI, LAP.
HIV	Aphthous like nulnerations

Systemic diseases with RAU<sup>1</sup>

### Index For Determining Impact of Oralulcer Activity In Patients of RAS:

In 2009 Mumucu et al.<sup>15</sup> recommended a combined index to record the clinical manifestations associated with oral ulcers in patients of RAS and Behcet's disease. This index gives us information regarding the prognosis of disease and therapeutic effect of medication. The index contain three variables.

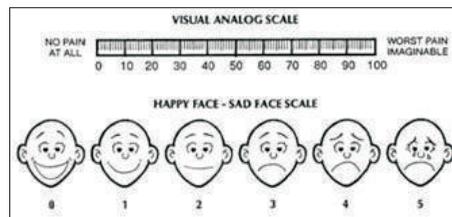
- Oral ulcer activity
- Ulcer related pain
- Functional disability

1. Oral ulcer activity was recorded as number of ulcers in the past 1 month.

0	No ulcers present
1	If the number of ulcer was greater or equal to than one

0	NONE OF THE TIME
1	LITTLE OF THE TIME
2	SOME OF THE TIME
3	MOST OF THE TIME
4	ALL OF THE TIME

2. The pain status was evaluated on a visual analogue scale (VAS).



This is a 100-mm line with extreme values at either end.

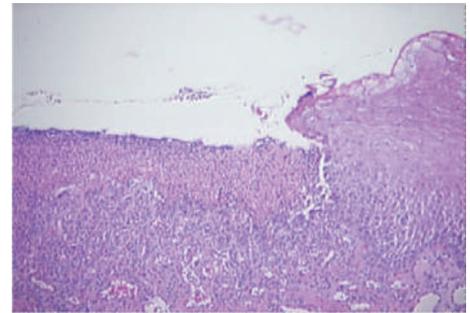
The patients have to mark the intensity of pain on the line

3. Functional status evaluation: This involved the evaluation of effects of oral ulcers on tasting, speaking, and eating/chewing/swallowing. This was assessed by by Likert-type scale.

Use of visual analog scale to evaluate the pain caused by ulcers is highly subjective and is ridden with interpersonal variation. This is a continuous scale with no discrete levels as would be suggested by grades such as none, mild, moderate, or severe. More studies in diverse population and ethnic groups need to be executed using this criteria to prove this index.<sup>1</sup>

### HISTOPATHOLOGY OF RAS

Histopathology of aphthous ulcer is non-specific/exact. Mucous membrane of shows superficial tissue necrosis with a fibrinopurulent membrane covering the ulcerated area. Necrosis is covered by neutrophils. Epithelium is infiltrated by lymphocytes and few neutrophils. Mononuclear lymphocytes are appreciated in adjacent areas. Minor salivary glands mostly appear in areas of apthae reveal focal periductal and perialveolar fibrosis and chronic inflammation.<sup>7,16,17</sup>



A central ulcer with a thick fibrin bed containing numerous neutrophils



Shafer's textbook of oral pathology 6<sup>th</sup> edition.

The typical anitschkow cell in a cytologic smear from the margin of an aphthous ulcer. It a prodromant cell but not pathognomonic

### Differential diagnosis

- Herpangina
- Herpetic stomatitis
- Erythema multiforme
- Erosive lichen planus
- Pemphigus
- Pemphigoid.

## Diagnosis

RAS diagnosis is based on history, clinical presentation, and histopathology.

Major criteria	Description
Clinical presentation	Solitary or multiple round or oval ulcers, shallow, regular margins, yellow-gray base, surrounded by erythematous margins. Ulcers are never preceded by vesicles.
Recurrence	At least three attacks of RAS within past 3 years, ulcers do not appear in the same focal site
Mechanical hyperalgesia	It is painful lesion, worsens by movement of ulcer affected area.
Self-limitation of condition	Ulcer heals spontaneously without sequelae with or without treatment

## Major criteria for diagnosis of minor RAS (Natahet al. 2004)<sup>7</sup>

Minor criteria	Description
Family history of RAS	Positive family history of RAS present
Age of onset	First attack below 40 years
Location	Non-keratinized oral mucosa
Duration	Ulcers lasts from days to few weeks
Pattern of recurrence	Irregular
Histopathological examination	Non-specific inflammation

## Minor criteria for diagnosis of minor RAS

### Management

There is no absolute curative treatment for RAS. The exact systemic association with RAS must be ruled out, specially in cases where there is abrupt development of ulceration in adulthood. Laboratory investigations such as CBC, red cell folate, serum ferritin levels, and vitamin B12 recommended. Screening for GSE must be done in cases where associated systemic manifestations of GSE are present.<sup>3,18,19,20</sup>

### Conclusion

RAS is a very common, recurrent painful ulceration occurring in the oral cavity. Etiopathogenesis of this disease is yet debatable. Treatment planning must be directed towards providing Symptomatic relief by reducing pain, increasing the duration of ulcer-free periods, and accelerating ulcer healing.

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## EventTalk

20-22 Febru 2020	BIDEM 2020 BICC Agargaon, Dhaka
28-29 March 2020	EXPODENT CHENNAI 2020 Chennai Trade Center Chennai
29-31 May 2020	FAMDENT SHOW 2020 Bombay Exhibition Center Mumbai
11-12 July 2020	DELHI DENTAL SHOW 2020 Pragati Maidan New Delhi
05-06 Sept 2020	EXPODENT BANGALURU 2020 Bangalore I E Center Bangaluru
18-19 Sept 2020	EXPODENT CHANDIGARH 2020 Palm Resorts Chandigarh
03-04 Oct 2020	EXPODENT MUMBAI 2020 Bombay Exhibition Center Mumbai
Oct 2020	WORLD DENTAL SHOW 2020 MMRDA Ground Mumbai
09-11 Oct 2020	33 ISDR 2020 The Leela Hotel New Delhi
24-26 Dec 2020	74 <sup>th</sup> INDIAN DENTAL CONFERENCE Biswa Bangla Convention Centre, Kolkata
25-27 Dec 2020	EXPODENT INTERNATIONAL 2020 Pragati Maidan New Delhi
09-13 March 2021	38 <sup>th</sup> INTERNATIONAL DENTAL SHOW Cologne

# Class 4 Restorations: Predictable Protocols

**Dr Sanah Sayed**

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I Smyle Dental Centre, Kalyani Nagar, Pune

**C**lass 4 restorations can either be extremely easy or difficult to do. Easy because these restorations work favourably since the C factor ensures the polymerization shrinkage to be a minimum with the ratio of bonded to unbonded surfaces in a low stress zone. However they are fairly difficult in terms of technique and getting the right shade that matches with the traumatised tooth. If the fracture happens to be in the pulp or approaching it the tooth darkens over a period of time which may warrant a Root canal therapy, walking bleach and once the shade stabilizes in a week to ten days we can build the tooth in Composite resin.

Here we simplify the technique with Predictable Protocols and Shade matching techniques that not only save time but also ensure excellent characterisation and vital appearance.

We now share a step by step protocol to break up the myth surrounding these restorations. We begin any Class 4 fracture case with a Study model which can be made by pouring an Impression made in Addition Silicone, putty and light body impression material. Once we have the defect in stone either wax or composite can be used to build the tooth anatomically. I usually do this myself, however if the clinician isn't too comfortable handling this step he could send the same to the Laboratory for a quick Mockup.

While we treat this case we must bear in mind that for an inexperienced clinician a Silicone index fabricated from the mock up cast and Infinity bevel are an absolute must to reach a stunning end result. Once we are well versed with these cases free hand build ups with clear matrices come easily.

In my 10<sup>th</sup> year of practice I still lean on Silicone indexes for a large angle fracture to carry the case with ease and simplicity.

## Shade Selection

Dentin shades are best selected by placing a composite button on the cervical area. Body shade can be selected using the middle one third area of the tooth and Enamel is best selected by placing against the Incisal one third region. All of these should be cured since composite after curing may appear different. Once the shade is decided it can be easily flicked off using a sharp instrument.

## Protocol

We carry out the procedure by making an Infinity bevel using a coarse disc from 3M at an angle of 45 degree. Apply 37% phosphoric acid for 15 seconds on enamel and 5 seconds on dentin followed by washing thoroughly but keeping the area moist followed by scrubbing 3M Universal bond, air drying for 20 seconds and curing

for another 20 seconds. We start building the palatal wall in a Clear translucent shade to make sure the mamellons and Halo are well expressed against a bluish or grayish backdrop. The Halo can be made by placing A1 Dentin shade (3M) or White opaque tint (Paint on kit: Coltene) depending on space available for the buildup. Mamellons are made in a dentin shade as per the fractured portion of the tooth followed by a body shade if the space allows. Many a times a dentin shade followed by an Enamel shade (2 step technique) can also give good results. The exact recipe for a life like restoration comes with many trials and errors in an early career however it has been simplified a great deal by the availability of composites of various opacities today.

## Light Perception

The make or break of any restoration is the ability of the human eye to perceive light as it bounces, scatters, reflects or absorbs through it. The human eye is extremely sensitive to values so a certain brightness or dullness of a restoration is easily perceived as opposed to subtle differences in chroma. The right combination of dentin- enamel shades with proper finishing & polishing protocols ensures a well received, blended and homogenous restoration.

Once the build up is complete, we apply K Y Jelly to ensure removal of Oxygen Inhibition Zone light curing it for 40 seconds.

## Finishing & Polishing

Finishing & Polishing protocols require time and patience from both the clinician & the patient. We start with a red ring sharp bur that removes gross excesses and blends the restoration with the tooth surface. All finer procedures can be carried out by a carbide 10, 20 and 30 fluted bur that ensure no tooth structure is damaged and all changes are made in Composite only. Soflex Discs from 3M are the perfect armamentarium to have for any beginner to carry out changes in shape and texture. Transitional line angles and secondary characteristics help in masking the restoration & blending with the tooth surface. Enhance kit from Dentsply is a great kit for Polishing protocols with fine and extra fine pastes. Jiffy brush from Ultradent is a goat hair wheel which imparts great lustre to the restoration. A cotton buff from Shofu or Cosmedent is usually the last step that one can do to achieve superlative finish and polish to a restoration which should last years without dulling out or accumulating stains. All polishing protocols must be done at slow speed of 5000 to 7500 rpm which prevents heating of the composite surface and burning out. This can be done in wet or dry conditions depending on the operator and as specified by the manufacturer.



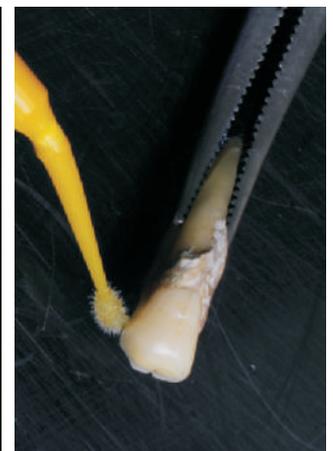
Initial Situation



Infinity Bevel



Etch Application



Application of 3M Universal Bond

Sayed: Class 4 restorations- Predictable protocols



Silicone index



Palatal shell



Halo in A1 dentin



Halo & Mamellons



Enamel shade layering



Build Up Complete



Removing Oxygen Inhibition Zone



Finishing with Soflex discs



Final Polish with Jiffy brush and cotton buff



Class 4 Pre Post

Sayed: Class 4 restorations- Predictable protocols



pre 1



pre 2



pre 3



Pre Shade Selection



pre 4



pre 6



post 1



post 2



Texture 2



Texture



Pre & Post

## Chorion Membrane: Periodontal Aspect

Dr. Nitin Bhatnagar

### Abstract :

Chorion membrane is a fetal membrane, composed of amniotic and chorion tissues. The chorion forms the outer limit of the sac that encloses the fetus and is composed of different type of collagen and cell adhesion bioactive factors. These are known to aid in the formation of granulation tissue by stimulating fibroblast growth and neovascularisation. These properties suggest that a chorion membrane may have considerable potential for regeneration

### Introduction :

Placental membranes have their origin from extraembryonic tissue. This tissue is composed of a fetal component (the chorionic plate) and a maternal component (the deciduas). The fetal component includes the amnion and chorion membranes which separate the fetus from the endometrium. The structure of amniotic membrane has three parts which are epithelial monolayer, a thick basement membrane, and an avascular stroma<sup>1</sup>.

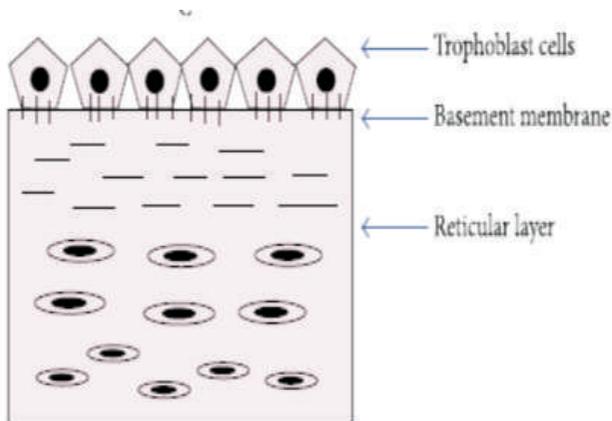


Fig 1. Line diagrammatic representation of histological architecture of chorion membrane<sup>1</sup>

Placental membrane	Layers of placental membrane	Extracellular matrix component
Chorion	(1) Reticular layer (2) Basement membrane (3) Trophoblasts/Collagen	Types I, III, IV, V, and VI, proteoglycans Collagen type IV, fibronectin, and laminin

Table 1. Structure and composition of placental membrane (chorion)<sup>1</sup>.

### Anatomy And Histology :

Chorion membranes have a rich inheritance of collagen types I, IV, V, and VI, proteoglycans, laminin, and fibronectin. Collagen is well tolerated and bioabsorbable, has hemostatic properties, and encourages migration of adjacent autogenous connective tissue and epithelial cells over its surface. Laminins exhibit variety of biological activities including promotion of cell attachment, growth, and differentiation of number of cell types. Fibronectin is involved in many cellular processes including tissue repair, blood clotting, cell migration, and adhesion. Such diverse properties make them a unique novel and potential biomaterial for use in medicine, tissue engineering, stem cell research, repair, and regeneration.<sup>2</sup>

### Properties Of Chorion Membrane :

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#### • Biomechanical Properties

Thickness of normal chorion membrane lies between 0.02 and 0.5 millimetres which includes around 6–8 layers of cells. An average surface area of this membrane is about 1600 square centimetres. An important property of chorion membrane is its resistance to various proteolytic factors owing to the presence of interstitial collagens. Elastin present in amnion is responsible for providing elasticity. It has multiple metabolic functions such as its role in water and soluble material transportation and production of bioactive peptides, growth factors, and cytokines<sup>3</sup>.

#### • Promotion of Epithelialization

Chorion membrane facilitates migration of epithelial cells, reinforces basal cell adhesion, promotes epithelial differentiation, prevents epithelial apoptosis, and promotes epithelialization in healing of wounds<sup>4</sup>. Various growth factors produced by amniotic membrane can stimulate epithelialization<sup>5</sup>. It can also promote expansion and maintenance of epithelial progenitor cells in vivo and can produce endothelin-1 and parathyroid hormone related protein. Brain natriuretic peptide and corticotrophin releasing hormone are also produced by membrane epithelial cells which play roles in increasing cellular proliferation and calcium metabolism. Expression of mRNA for epidermal growth factor, hepatocyte growth factor receptor, and keratocyte growth factor receptor was demonstrated by Koizumi et al. in 2000<sup>22</sup> in cryopreserved amniotic membrane. Its basement membrane serves as a safe and suitable bed for the growth of epithelial cells. Sufficient oxygenation for epithelial cells is provided by its good permeability in contrast to other synthetic materials. Thus, amniotic membrane is an ideal tissue which facilitates the growth of epithelial cells, helping in their migration and differentiation<sup>6</sup>.

#### • Inhibition of Fibrosis

The amniotic membrane possesses antifibrosis property. Fibroblasts are naturally responsible for scar formation during wound healing and are activated by transforming growth factor  $\beta$ . Amniotic membrane reduces the risk of fibrosis by down regulation of transforming growth factor  $\beta$  and its receptor expression by fibroblasts. There-fore, scaffold of an amniotic membrane modulates wound healing by promoting reconstruction of tissues rather than promoting formation of scar tissue<sup>7</sup>.

#### • Inhibition of Inflammation and Angiogenesis

The exact mechanism of the anti-inflammatory properties of

amniotic membrane is not clear. It is hypothesized that it decreases influx of inflammatory cells to the wound area and consequently reduces inflammatory mediators by serving as a barrier. It entraps T lymphocytes when it is applied as a patch *in vivo*<sup>29</sup>. Matrix metallo-proteinases released by neutrophils and macrophages are taken care of by inhibitors of matrix metalloproteinases found in the amniotic membrane. Presence of various tissue inhibitors of metalloproteinases 1, 2, 3, and 4, interleukin-10, and interleukin-1 receptor antagonists and endostatin which inhibit endothelial cell proliferation, angiogenesis, and tumor growth has also been observed in amniotic membrane<sup>30</sup>. The presence of proteinase inhibitors may facilitate wound healing<sup>31</sup>. Thrombospondin-1, secreted by the amniotic epithelium, acts as an antiangiogenic factor. Two very potent proinflammatory mediators, interleukin-1 $\alpha$  and interleukin-1 $\beta$ , are suppressed by matrix of stroma of amniotic membrane. Shimmura et al. in 2001<sup>29</sup> reported that amniotic membrane reduces inflammation through entrapment of inflammatory cells. A high molecular-weight glycosaminoglycan, hyaluronic acid, present in large quantities in amniotic membrane acts as a ligand for CD44 which is expressed on inflammatory cells. It plays an important role in adhesion of inflammatory cells including lymphocytes, to the amniotic membrane stroma. Other substances expressed in the amniotic membrane are low-molecular-mass elastase inhibitors which include secretory leukocyte proteinase inhibitor and elastin. These inhibitors have antimicrobial actions in addition to their anti-inflammatory properties. They protect related surfaces from infection, thereby acting as components of the innate immune system<sup>32</sup>. Both antimicrobial and anti-inflammatory properties can also be induced into amniotic membranes by their treatment with both lactoferrin and interleukin-1 receptor. Lactoferrin, a globular multifunctional protein, has both antimicrobial and anti-inflammatory qualities. It serves as an antioxidant and an iron chelator in tissues and suppresses the production of interleukin-6 in the amniotic fluid during amniotic infection. Interleukin-1 receptor antagonist on the contrary reduces inflammation as it is a potent inhibitor of interleukin-1 which is a mediator of inflammation<sup>8</sup>.

#### • Lack of Immunogenicity

Occurrence of acute rejection after transplantation of amniotic membranes is negated by the fact that amniotic epithelial cells do not express HLA-A, HLA-B, HLA-D, and HLA-DR antigens but express HLA-G on their surfaces<sup>34</sup>. Presence of interferon  $\gamma$  and other immunologic factors has also been observed in the amniotic membrane. It seems that amniotic membrane may induce immunologic reactions in the presence of viable epithelial cells. One study revealed that transplantation of fresh amniotic membrane is associated with a mild inflammatory response. This could be probably due to expression of HLA-I antigens by viable epithelial cells<sup>35</sup>. However, immunogenicity of cryopreserved amniotic membrane is less than that of fresh amniotic membrane as epithelial cells are lost in cryopreservation. T lymphocytes in allografted limb cells are

suppressed by amniotic membrane. This implies immunosuppressive properties of amniotic membrane which can increase the chances of successful grafting. As tissue grafts of placental membrane materials present a low risk of immune rejection, they are considered to be bestowed with "immune privilege"<sup>9</sup>.

#### • Antimicrobial and Antiviral Properties

The risk of infection is reduced by amniotic membrane due to its antimicrobial and antiviral properties<sup>38</sup>. Microorganisms upon their entry into the body are eliminated by our immune system through an adaptive immune response,  $\beta$ -defensins, a major group of antimicrobial peptides and an integral part of the innate immune system, which are expressed at surfaces of mucosa by epithelial cells and leukocytes<sup>39,40</sup>. Amniotic membranes also have the ability to produce  $\beta$ -defensins with the predominant type present in amniotic epithelium being  $\beta$ 3-defensin. Kjaergaard et al. in 2001<sup>41</sup> have also shown *in vitro* antimicrobial effects of the amnion and chorion against certain microorganisms. Its antiviral properties are exhibited by presence of cystatin E, the analogue of cysteine proteinase inhibitor<sup>41</sup>. There is still further need for studies to verify these properties of the amniotic membrane<sup>42</sup>. Amniotic membrane may prevent infiltration and adhesion of microorganisms to wound surfaces by acting as a barrier. The hemostatic property of collagen fibers of amniotic basement membrane prevents hematoma formation in clean surgical wounds. This reduces bacterial load and risk of infection by preventing accumulation of microbes. Another mechanism of action against infection by membranes is through their adhesion to the wound surface. This attachment prevents formation of dead space and accumulation of serous discharge. Furthermore, bacterial entrapment and stimulation of migration of phagocytes also occur by fibrin filaments formed during wound healing. These filaments cause adhesion of the wound bed to amniotic membrane collagens. There is a report that bacterial proliferation is reduced even in contaminated wounds by amniotic membrane<sup>10</sup>.

#### • Cell Differentiation Property

The fetal placental tissues have the potential to transform into different cell lineages. The hematopoietic lineage is found in the chorion, allantois, and yolk sac; and the mesenchymal lineage is found in both the chorion and amnion. The cells isolated from the chorion are good sources of cells of hematopoietic and mesenchymal lineages as they possess these properties. It is considered that the amniotic membrane can maintain pluripotent stem cell potential for cell differentiation<sup>10</sup>.

#### Uses In Periodontics :

1. Periodontal Regeneration
2. Promotes Wound Healing
3. Act As A GTR Membrane
4. Promotes Osteogenesis

#### Related Studies:

Chakroborthy S, Sambastiviah S, Kulal R, Blincomath S. (2015)<sup>11</sup> conducted a clinical trial with twelve systemically healthy patients having at least 2 bilateral Miller's Class I or Class II gingival recession were recruited and coronally advanced flap was

performed with amnion membrane or chorion membrane. Clinical parameters such as gingival Index, plaque index, length of the recession, width of the recession, width of keratinized gingiva, relative attachment level were evaluated at baseline, 3 and 6 months post-surgery. Results comes out to be, total mean percentage of root coverage was 34% for chorion site and 22% for amnion site. Both amnion membrane and chorion membrane has shown to be versatile allograft material to be used in the treatment of root coverage.

Suresh DK, Gupta A (2013)<sup>2</sup> They have presented a case report in which a 56-year-old male with a vertical recession depth of 2 mm in the maxillary right canine was treated with coronally advanced flap along with placement of chorion membrane. Three months after surgery, there was 100% root coverage, and the soft-tissue biotype also changed from thin to thick. Chorion membrane, which is a rich source of various collagen and non-collagen proteins, can be used for root coverage and

enhancement of thin gingival biotype to thick biotype.

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# Managing Rehabilitation of Failing Bridge Associated With Horizontally Impacted Canine With Implants in A Geriatric Patient: A Case Report

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## Abstract

When impacted maxillary canines are not manageable by orthodontic traction or reimplantation, available option left is extraction, followed by implant placement, which is a challenge due to the bone resorption occur due to complex tooth extraction and which often requires bone grafting. Immediate dental implant placement appears to be the adequate strategy to replace missing teeth. The aim of this case report is to evaluate the implant placement immediately after removal of maxillary canine impacted.

**Keywords:** Maxillary impacted canine; Immediate implant; Immediate placement

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## Introduction

The surgical-orthodontic treatment of impacted maxillary canine (IMC) is still a challenging situation for clinicians. Therapy of IMC involves the exposure of the retained canine, its traction in the arch and the alignment and levelling with orthodontic equipment. Bone loss, root resorption and gingival recession around IMC are some of the most common complications. Therapies of IMC are generally very long and complicated, so alternative methods have been studied to restore the missing canine. IMC can be defined as the infraosseous position of the tooth after the expected time of eruption, whereas the anomalous infraosseous position of the canine before the expected time of eruption can be defined as a displacement. Most of the time, palatal displacement of the maxillary canine results in IMC. [1]

IMC is a common finding of oral pathology and represents 2% of patients seeking orthodontic treatment. IMC is one of the most frequently impacted teeth, second only to third molars with the prevalence ranging from 0.8 to 5.2% depending on the population examined. The incidence of IMC is more than twice than that in the mandible, and the ratio of palatal to buccal impaction is 8 to 1.8% of IMC is bilateral and it is twice more common in girls than boys. Some of the primary etiological causes of IMC are space deficiency, retention of primary canine/ premature root closure/ disturbances in tooth eruption sequence, trauma, rotation of tooth buds and localized pathological lesions (cysts, odontomas). [2]

Currently placement of an implant immediately after tooth extraction is a common procedure [3,4]. Some recent clinical systematic reviews have indicated it as a very promising approach in selected cases [5,6], including immediate loading of post-extraction implants placed in infected sites [7]. The main advantage being the reduction in surgery and treatment time [6]. In the case of a impacted maxillary canine tooth, the possibility of immediate implant placement after extraction depends on the presence of adequate residual apical bone because it allows the implant to be positioned and anchored bicortically which helps in achieving good primary stability [8]. Within the literature have reported cases of implants installed after the removal of a retained canine with 1- to 8-year follow-up [9]. However, there are no studies of systematic reviews or similar

The aim of this case report is to evaluate the implant placement immediately after removal of maxillary canine impacted.

## Case Report

A 80 year old female patient came with complain of failing bridge in upper right side quadrant. (Figure. 1) All the pontics have decayed therefore extraction followed by implant retained fixed prosthesis for

rehabilitation was advised to the patient.



Figure. 1 - Pre-operative image of patient

But there was a horizontally impacted canine placed in maxilla in that region. Hence CBCT was done to find if we can strategically place implants bypassing the canine or not. But result ruled out that possibility. (Figure. 2)

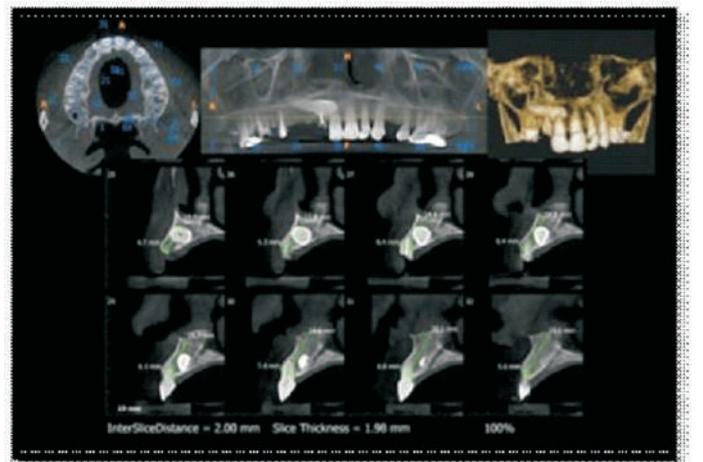


Figure.2 - CBCT of patient

As a result, transalveolar extraction of impacted canine was carried

out with a minimal invasive approach possible so that speedy healing can facilitate early implant placement after surgery.( Figure. 3 a, b)

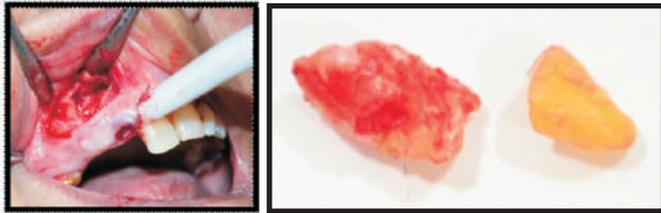


Figure. 3a,b - Extraction of impacted canine

After a month of surgical extraction and result of new CBCT (Figure. 4) allowed for strategic placement of implants and a good primary stability was achieved.(Figure.5)

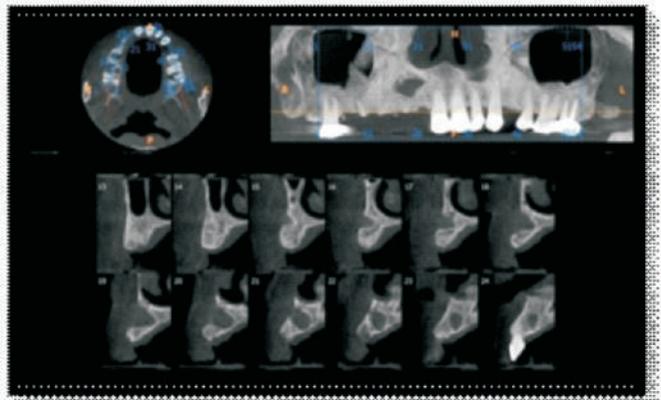


Figure.4 - CBCT after the extraction



Figure.5 - Implant placement

After 3 months, ISQ of all the implants were obtained with Ostell ISQ meter, which came out to be biologically well stable. Following this, implant level impressions were made and screw retained crowns were delivered.(Figure.6)

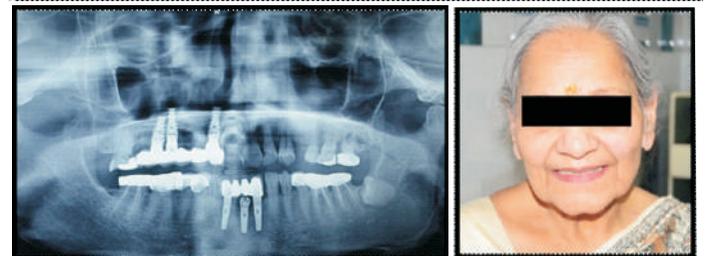
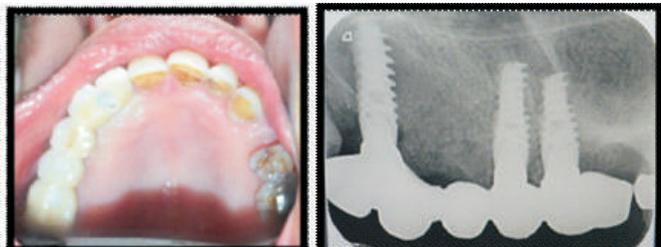


Figure. 6a-e - Final prosthesis

If this impacted canine had been orthodontically or surgically intervened at young age, the complications with the patient had been very less.

### Discussion

The clinical management of impacted canine can be challenging and frustrating [10]. When patients are unwilling to accept orthodontic treatment and/or the impacted canines are in a high position precluding orthodontic traction, the treatment of choice is extraction [11].

Mazor, et al. [12] suggested a alternative of installing an implant immediately after the removal of the impacted maxillary canine. The procedure based on the application of the immediate post-extraction implants, which is a procedure that has been widely documented and has a success rate similar to implants in healed site's placement [3-7].

Anitua, et al. [7], recently reported that it can be performed Immediate implant placement into infected sockets in association with immediate loading. With an average follow-up of 6 years (range 1 to 8 years) and 65% of the implants had a followup time > 5 years. No implant failure occurred with the success rate 93%.

In the same way, Lang, et al. [13], report to the mean survival of the post-extraction implants with immediate loading has been 98.4% (after 2 years of follow-up) and has decreased to 97.5% with a range of 95.2 to 98.8% (after \_\_ 3 years follow-up). The publications analyzed in this review are prospective studies, case series and case report, which result in 100% success in all treated cases (53 implants). These installed immediately after the removal of the impacted maxillary canine, both palatal and labial.

So implant placement might be considered a valid alternative for IMC treatment. In fact implant dentistry has reached success rate of above 80%, but peri-implantitis is the most important delayed complication (14-23). Factor which are favorable for onset of disease are oral biofilm formation (poor oral hygiene), host defence capability (smoking habit, excessive alcohol consumption, genetic traits, history of peri-odontitis, use of bisphosphonates). These factors might favour developing of peri-implantitis and periodontal disease, which diagnosis and treatment require dentist's engagement (24-29).

This new surgical procedure for IMC treatment has been created new interfaces with the implants: implant-periodontal ligament, implant-cement, implant-dentine, and an implant-pulp and implant-enamel interfaces (30). Since this surgical approach is new, long-term data involve only a limited number of patients and implants. Further studies are

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needed to validate this procedure.

### Conclusion

This treatment is viable and with a good outcome, although more works is needed to determine adequate the results and thus determine the potential impact of this treatment alternative.

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## Diabetes Mellitus & Periodontal Disease

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### Abstract

The association between diabetes mellitus and periodontal disease has been studied in the last years, and several studies conclude that diabetes mellitus is a risk factor for the development of gingivitis and/or periodontitis in both diabetes type 1 and 2. In this review article we intend to demonstrate the possible association between diabetes mellitus and periodontal disease, assessing their main characteristics, the association with social status and the influence of periodontal disease control on Diabetes mellitus. Scientific research in recent years regarding this specific issue has allowed the establishment of a clear association between periodontal disease and diabetes mellitus among diabetics type 1 and 2. The main complications of diabetes mellitus are angiopathy, neuropathy, nephropathy and retinopathy. Several studies have demonstrated the oral manifestations of diabetes mellitus, assuming particular highlight the periodontal disease. There should be an interaction between general practitioners and dentists so that such patients have the appropriate preventive care and persistent periodontal therapy in specialized medical and dental clinics.

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### Introduction

**D**iabetes mellitus is a silent disease, which means that without medical tests the patient may be unaware of having this disorder. In an early stage, the patient may not present signs and symptoms compatible with the disease. It's a common disease worldwide, mainly in the United States of America (USA), affecting 7.6% of the adult population, between 30 and 69 years old, and 0.3% of pregnant women. Impaired glucose tolerance is observed in 12% of adults and 7% of pregnant women. It is estimated that about 50% of diabetic patients are unaware of the diagnosis. According to an international projection, due to a growing sedentary lifestyle, obesity and population ageing, diabetes will increase worldwide by over 50% in 2025.

Diabetes is in the top five of the highest mortality rate diseases in the world and is getting closer to the top of the list. Over the past 20 years the number of diabetics in North America has increased considerably. In 2005, there were about 20.8 million people with diabetes in the USA alone. According to the American Diabetes Association there are about 6.2 million people undiagnosed and about 41 million people who could be considered pre-diabetic.

Periodontal disease is an infectious inflammatory illness that may compromise gums and its attachment tissues, such as, cementum, periodontal ligament and alveolar bone. It is characterized by insertion loss of the periodontal ligament and bone destruction of adjacent tissue. The development of this process leads to teeth loss and destruction of the periodontal ligament by bacterial action. Dental plaque and calculus inflame these structures leading to the formation of periodontal pockets, thereby to tooth mobility.

Concerning oral pathologies, periodontal disease is one of the most prevalent oral diseases worldwide along with dental caries and is associated with various systemic diseases, particularly diabetes mellitus. In this review article we intend to demonstrate the possible association between diabetes mellitus and periodontal disease, assessing their main characteristics, associations with social status and influence of periodontal disease monitoring in diabetes mellitus.

### Diabetes Mellitus

Diabetes mellitus is a group of metabolic diseases which is characterized by hyperglycemia. Its prevalence has been increasing in recent decades, both in developed and in developing countries.

### Diabetes Can Be Classified Into The Following General Categories:

**Type 1 Diabetes:** It is characterized by changes in pancreatic  $\beta$ -cells, lack of insulin production and insulin secretion and tendency to ketoacidosis. It corresponds to 5% to 10% of cases, being more frequent among children and adolescents, with a peak incidence in both genders, between 11 and 14 years old, although it can occur in any age group. In most cases (85-90%) occur in patients with human leukocyte antigens, or associated with a strong genetic predisposition. The genetic predisposition linked to environmental factors, such as mumps virus and coxsackievirus B4 promotes a destructive autoimmune process, and highly selective pancreatic  $\beta$ -cells. When there is no evidence of autoimmunity it is considered idiopathic diabetes. The slowly progressive form generally occurs in adults and is referred as latent autoimmune diabetes of adults.

**Type 2 Diabetes:** It is the most common being responsible for 85% to 90% of cases and is characterized by a reduced sensitivity to insulin coupled with an insulin deficiency. Type 2 diabetes is more prevalent in

patients aged over 40, obese and that do not practice physical exercise. Usually, most type 2 diabetics can use oral antidiabetic agents in the early years after diagnosis. However, they may need insulin for a good glycemic control through the years.

**Other Specific Types of Diabetes Mellitus:** Includes all diabetes cases in which the etiological factor is known, but having a lower incidence. For example, functional genetic defects of  $\beta$  cells with deficiency in insulin secretion; genetic defects in insulin action; diseases of exocrine pancreas (pancreatitis, trauma, infection, pancreatic cancer, hemochromatosis, cystic fibrosis); endocrine diseases that cause hyperglycemia (acromegaly); certain drugs and chemicals; viral infections; genetic syndromes (Down syndrome, Turner syndrome). Gestational diabetes: it is characterized by glucose intolerance diagnosed during pregnancy and may or may not persist after pregnancy. Women with increased body weight, over 25 years old and a familial history of diabetes mellitus have a medium or high risk for developing this type of diabetes, and thus should be monitored throughout pregnancy. In any form, the absence of insulin can cause chronic and acute metabolic disorders. Systemic and oral signs and symptoms aid in the evaluation and diagnosis of diabetes.

These signs and symptoms include polyuria, polydipsia, polyphagia, weight loss, fatigue, blurred vision, nausea, drowsiness, dehydration. Systemic chronic complications of diabetes mellitus affect multiple body systems and there may be cases of retinopathy, neuropathy, nephropathy, peripheral vascular diseases, coronary heart disease, central and peripheral nervous system and dermatological problems. In the oral cavity, the most frequent complications related to diabetes mellitus are: acetone breath, red furry tongue, increased asymptomatic parotid, gingival hypertrophy, alveolar resorption, tooth mobility, higher prevalence of stomatitis, increased incidence of dental caries due to the increase enamel hypoplasia and hypocalcification, increased susceptibility to oral candidiasis and angular cheilitis due to xerostomia.

### Periodontal Disease

It is a disease in the oral cavity characterized by inflammation of teeth supporting tissues that evolve continuously, having periods of exacerbation and periods of remission.

### There are two ways to classify this disease:

**Gingivitis:** It is characterized by soft tissues' inflammation but connective tissue remains attached to the tooth and does not occur insertion loss and if not promptly treated, may develop into periodontitis.

**Periodontitis:** It is the most severe form of periodontal disease affecting the deeper structures and is characterized by destruction of the periodontal ligament and apical migration of connective tissue. In a periodontal disease, accumulation of dental plaque leads to insertion loss due to resorption of the alveolar bone. Both forms are characterized by several signs and symptoms that should be analyzed during periodontal examination, in order to use the most appropriate therapy.

Gingivitis is clinically characterized by bleeding on probing, increased flow of crevicular fluid, hyperplasia, smooth and shiny gums, and radiologically by no bone loss. Periodontitis is clinically characterized by erythema and exudate, bleeding on probing, gingival recession, tooth mobility, insertion loss, furcation involvement halitosis; radiographic there is a horizontal and/or vertical bone loss that can be classified as mild, moderate or advanced.

Periodontal disease has become a worldwide public health issue affecting more the adult population. It usually starts as a gingivitis progressing quickly to a destructive periodontitis. Its development is

influenced by multiple systemic, local and environmental factors.

Diabetes mellitus and periodontal disease are two common chronic diseases and, according to several research studies, are biologically interconnected. Periodontal disease is a result of micro vascular diabetes mellitus. There is scientific evidence showing that diabetes is a risk factor for gingivitis and periodontitis and that blood glucose control is crucial in this interaction. Thus, periodontal disease is clearly a clinical manifestation associated with several systemic diseases including diabetes. There is supremacy of Gram -anaerobic bacteria in periodontal pockets and/or gingival sulcus that stimulate the immune system cells and consequently release inflammatory mediators. These mediators get into the bloodstream and increase inflammation present in diabetes and interfere with blood glucose levels' regulation, leading to development and aggravation of diabetic complications.

Thus, periodontal treatments like root scaling associated with antibiotic therapy, reduce periodontal pathogens, inhibit the secretion of inflammatory cytokines and also inhibit nonenzymatic glycosylation. It is important to submit diabetic patients to regular periodontal therapy in order to avoid reinfection and maintaining good metabolic control.

### Prevalence of Gingivitis & Periodontitis in Relation to Diabetes

The prevalence of periodontitis in the United States is subject to controversy. Current data suggest that the prevalence of periodontitis has decreased across ethnicity, sex, and age-groups to < 10%. Different interpretations of the same data suggest, however, that up to 50% of U.S. adults may suffer from various degrees of periodontitis. The prevalence of periodontitis is significantly higher among middle-aged people with diabetes than in similar-aged people without diabetes. Analysis of data from the third National Health and Nutrition Examination Survey has revealed that a self-reported family history of diabetes, hypertension, high cholesterol, and clinical evidence of periodontal disease bears a probability of 27–53% that the patient has undiagnosed diabetes. Analysis of periodontal status in people with type 1 or type 2 diabetes from a population-based German study has demonstrated an association between both types of diabetes and tooth loss. Attention to oral disease in addition to medical conditions by both medical and dental care providers will improve the ability to identify individuals unaware of their diabetic status. Dentists should establish referral patterns, communicate with physicians, and use dental screening as a tool for referral of patients with severe gingival or periodontal inflammation. It would be advantageous if blood glucose assessments were performed in dental offices for patients at risk for type 2 diabetes. Likewise, physicians should refer patients with type 2 diabetes to dentists for treatment of gingival or periodontal inflammation. This is especially important because the pathophysiology of periodontal inflammation is not limited to the oral cavity and can have important effects on glycemic control. Indeed, periodontitis has been identified as the sixth complication of diabetes.

### Pathophysiology of Periodontitis as a Complication of Diabetes

The oral cavity, as part of the gastrointestinal tract, is populated by a diverse and large microbiota and has been identified as a location with a more dense bacterial colonization than any other organ. Teeth provide a nonshedding surface with a complex biofilm containing bacteria that are in balance with the host, but bacterial species with high virulence can also be identified.

Periodontitis has a complex infectious etiology, and the establishment of infection is usually slow. A bacterial biofilm of both aerobic and anaerobic bacteria, including > 500 species, may be found in periodontal pockets around teeth. Bacteremia is rarely identified in periodontitis. However, endotoxins from bacteria identified in periodontal pockets and associated with periodontitis can be found in serum in > 30% of nondiabetic patients who present with early signs of periodontitis.

In general, the bacterial infection in periodontitis does not differ between nondiabetic patients and those with type 2 diabetes. However, the immune response to periodontal bacterial infection does differ in that patients with type 2 diabetes do not develop antibodies to pathogens associated with periodontitis. Many of the anaerobic bacteria associated with periodontitis have a lipopolysaccharide (LPS) capsule with endotoxins and heat-shock proteins. Pretreatment profiles of serum antibody titers to different heat shock proteins and LPS levels from *Porphyromonas gingivalis*, an anaerobe commonly found in periodontitis lesions, can predict the outcome of periodontal therapy in patients with diabetes such that those with elevated titers have a more favorable treatment outcome. Unpublished data based on 282 subjects, among whom 9.3% had type 2 diabetes with similar severity of

periodontitis, suggest that patients with type 2 diabetes may have fewer bacteria in periodontal pockets but the same severity of disease. These data suggest that the inflammatory response to infection in people with type 2 diabetes is more severe than in nondiabetic subjects (G.R.P, unpublished observations). This may be explained by a lack of ability to produce functional antibodies against bacteria in periodontal infection. This is illustrated in the diagram in Figure 2, which includes four bacterial species associated with periodontitis.

Mean Values x 10<sup>5</sup> Bacterial Cell Counts

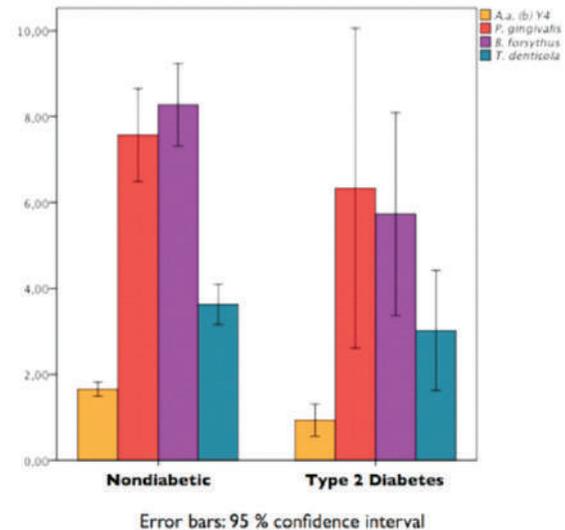


Figure 2. Levels of select bacteria associated with periodontitis in periodontal pockets of subjects without a diagnosis of diabetes and in subjects with type 2 diabetes. A similar severity of periodontitis, but with lower bacterial counts, was identified in subjects with diabetes for *A. actinomycetemcomitans* serotype Y4 (A.a. (b) Y4), *P. gingivalis*, *T. forsythia*, and *F. denticola*, all associated with periodontitis.

This observation is consistent with the general perception of an increased susceptibility to infection among patients with type 2 diabetes. Periodontal infections trigger the release of pro-inflammatory cytokines both at the site of the periodontal infection and throughout the endothelial cell system. Studies of gingivitis in humans with or without type 1 diabetes have shown that both diabetic and nondiabetic subjects react to experimental plaque accumulation with gingival inflammation.

However, subjects with type 1 diabetes develop an earlier and more severe local inflammatory response to a comparable bacterial challenge.

Further studies have shown that two biological markers of inflammation, IL-1b and MMP-8, which are typically elevated in the fluid from inflamed periodontal pockets, are more elevated in people with diabetes. People with type 2 diabetes also have higher levels of several other cytokines (i.e., interferon- $\gamma$ , osteoprotegerin, tumor necrosis factor- $\alpha$  (TNF-  $\alpha$ ), and interleukin at the site of periodontal infection but also exhibit a down regulation of interleukin 4.

An increasing severity of periodontitis has been linked to the development of glucose intolerance, likely because of increased inflammation leading to increase in interleukin-6 (IL-6). The liver is an important target for IL-6 action, leading to an increased inflammatory response with impaired insulin signaling and action and resultant decreased insulin production.

Patients with impaired insulin production are therefore unable to control for IL-6 activation and the enhanced inflammation induced by IL-6. Elevated IL-6 serum levels have been identified in people with untreated chronic periodontitis. These studies suggest that the presence of elevated serum levels of pro-inflammatory cytokines in patients with type 2 diabetes caused by periodontitis may aggravate inflammatory responses in other organs commonly affected in patients with diabetes. Other pathological factors in diabetes affecting the periodontal tissue are linked to elevated glucose levels in serum with development of advanced glycation end-products (AGEs), altered lipid mechanisms, and oxidative stress. Data suggest that AGEs present in diabetic gingiva can be associated with oxidative stress. Clinical data have suggested that the presence of AGEs in patients with diabetes is associated with the biofilm

on teeth, indicating an increased risk for periodontal damage.

### Association Between Diabetes Mellitus And Periodontal Disease

Several studies demonstrate an association between diabetes mellitus and periodontal disease. Following, there is a summary of some studies suggesting the association between these two disorders (Table 1) and another one that shows several studies presenting diabetes' control due to periodontal therapy performed in diabetic patients (Table 2).

### Conclusions

Patients with diabetes are usually poorly informed about the relationship between periodontitis and diabetes. Therefore, health care providers of patients with diabetes should be aware of this link and inform their patients about the need for good oral health.

Referral of patients with uncontrolled diabetes for dental evaluation and periodontal treatment may result in better control of blood glucose levels. Although a survey of the oral cavity should be included in a thorough medical examination, health care providers other than those within the dental team usually are not aware of what clinical signs of periodontitis to consider. An increased redness of the gum tissues along the teeth is a classic sign of gingivitis, a condition that indicates that there is an active inflammatory response to bacterial infection. The use of a toothbrush or a toothpick to gently touch the gums of diabetic patients with inflammation will provoke bleeding that will cease within minutes. Health care providers should suggest a thorough dental examination if such bleeding is common throughout a patient's mouth. Also, the presence of white or gray deposits on teeth suggests that dental treatment may be necessary. Spacing between upper front teeth and

mobile teeth are other signs of periodontitis. Likewise, dentists and dental hygienists should refer their patients who respond poorly to initial periodontal therapy or have advanced periodontitis without obvious signs of poor oral hygiene for diabetes screening. In fact, it might be advantageous for dental offices to monitor the blood glucose levels of patients considered to be at risk for diabetes.

### In Summary

- Diabetes and periodontitis are both common chronic diseases in adults and specifically in older individuals.
- There is substantial evidence of the impact of periodontitis on systemic inflammatory markers.
- Periodontal treatment of patients with diabetes may have limited effects on slightly elevated A1C levels, but in patients with more severe diabetes, such treatment may reduce A1C levels significantly if coordinated with blood glucose control.
- Signs of periodontal inflammation, including gingivitis, can be assessed easily by all medical health care providers.
- Patients with periodontitis with severe gingival inflammation who do not respond to routine periodontal therapy should be screened for diabetes.
- By communicating and coordinating the treatment of diabetic patients, medical and dental care providers have an opportunity to provide better care of their patients.

References See on Page 42

Table 1 & 2

Authors	Study Design	Methods	Results
Hugoson et al.	Cohort	82 patients with type 1 diabetes (long term).	Long-term type 1 diabetics have more tooth surfaces with periodontal pockets higher than 6mm than nondiabetics
		72 patients with type 1 diabetes (short term).	
		Periodontal probing, premolars & molars xrays for periodontal evaluation.	
Emrich et al.	Cross-sectional	1342 patients with type 2 diabetes & 1877 non diabetic patients, aged between 15-55 years old.	Type 2 diabetics have a higher risk of periodontal disease regardless their
		Periodontal evaluation by age, probing & analysis of alveolar bone loss	
Thorstensson et al.	Cross-sectional	Evaluation by probing, clinical characteristics of the gum, the alveolar bone level.	Diabetes mellitus is a risk factor for the development and progression of periodontitis.
		83 patients with type 1 diabetes and 99 nondiabetic patients, aged between 40-69 years old	
Tervonen et al.	Cross-sectional	55 patients with type 1 diabetes and 10 nondiabetic patients aged 29.	Increased bone loss in type 1 diabetics & more significant in long term diabetics.
		Bone loss assessment.	
		It has been considered glycemic control, duration & severity of diabetes.	
Mattout et al.	Cross-sectional	71 patients with type 2 diabetes and 2073 nondiabetic patients, aged between 35-75 years old.	Periodontal disease is more severe in type 2 diabetics.
		Assessment of gingivitis, periodontal pockets, periodontal attachment loss.	
		Fasting blood glucose levels.	
Bascones-Martínez et al	Literature review		There is an increased severity of periodontal disease in diabetics. Periodontal disease is considered to be the 6th major complication related to diabetes mellitus.
Kumar et al. [	Literature review		There is a clear association between the periodontal disease's severity and diabetes mellitus

Authors	Methods	Periodontal treatment	Metabolic control	Results
Iwamoto et al.[30]	13 patients with type 2 diabetes, aged between 19-65 years old	Local minocycline in periodontal pockets.	HbA1c	The treatment with minocycline was effective in improving metabolic control in diabetics.
Skaleric et al	10 patients with type 1 diabetes & 10 nondiabetic patients, aged between 26-58 years old. Duration of study:24 months	Scaling. Minocycline microspheres in pockets greater than 5mm.	HbA1c	Decrease HbA1c
Janket et al	456 patients with type 1 & 2 diabetes. Duration of study: 25years	Scaling Antibiotic therapy	HbA1c	
Schara et al.[	10 patients with type 1 diabetes, aged 38. Duration of study:10 months	Scaling Oral chlorhexidine	HbA1c	Decrease in HbA1c after 3 months of treatment.
Faria-Almeida et al.[	10 diabetics and 10 nondiabetic patients, aged between 35-70 years old. Duration of study:6 months.	Scaling	HbA1c	Significant decrease in HbA1c.
Darré et al.[	9 clinical trials with 485 type 1 and 2 diabetics.	Periodontal treatment	HbA1c	Decrease HbA1c
Kormantzios	30 patients with type 2 diabetes & 30 nondiabetic patients, aged between 40-75 years old. Duration of study:6 months	Non-surgical periodontal treatment every 7 days	HbA1c	Non-surgical periodontal treatment effective in patients with type2 diabetes & moderate or severe periodontal disease because there was a reduction in HbA1c levels
Wang et al	19 clinical trials with 143 patients having periodontal disease & type 2 diabetes mellitus.	Periodontal treatment with antibiotics and periodontal curettage	HbA1c	Insufficient scientific evidence to justify a direct relationship between periodontal therapy and metabolic control

# Corticotomy–Wilkodontics: A Gateway to Reduce the Conventional Orthodontic Treatment Duration

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## Introduction

The duration of the orthodontic treatment always remains a major concern for the patients and professionals. Many a times it's the only reason for the unwillingness for the treatment by the patient. Additionally few limitations of traditional treatment like root resorption, pulpal pathosis, need of extraction of few teeth, usage of heavy appliances have motivated the researchers to find better alternatives or adjuncts to conventional orthodontic treatment (1). Henceforth several methods have been put forwarded in last few decades to be used in association with the orthodontic tooth movement. Mainly three procedures are followed: osteotomy, corticotomy and piezoincision. Corticotomy and piezoincision are based on the principle of Regional acceleratory phenomenon (RAP) and osteotomy is based on process of distraction osteogenesis(2). The aim of this article is to review and summarize the information about the corticotomy assisted orthodontics.

**Phases of tooth movement:** Burston (1962) described the following phases of tooth movement: (3)

- a) Instantaneous tooth movement
- b) Lag phase
- c) Progressive linear phase

## Corticotomy

It is a surgical procedure which involves fracturing and injuring the cortical bone through microperforations, vertical and horizontal cuts(4). This process increases the bone regeneration and bone healing and thereby decreasing the treatment duration and facilitating the rapid movement of teeth. Various modifications have been tried like addition of synthetic grafts and resorbable membranes(5).

**Historical background:** In 1892, L.C.Bryan reported the usage of corticotomy technique for the first time in association with the orthodontic treatment. Later in 1959, Heinrich Koleproposed the concept of bone block movements to accelerate the orthodontic treatment. According to him, osteotomy cuts could be performed in the cortical bone (as it provides greatest resistance) leading rapid movement of tooth. This procedure reduced the treatment time by approximately 6 to 12 weeks and was indicated for separation of single or grouped teeth. Between 1975 and 1978, a novel technique called fast orthodontics was introduced by Chung in which combination of cuts and orthopaedic forces along with use of intraosseous anchoring devices (mini implants and mini plates) were used for faster movements of teeth. In 1978, Generson proposed a modification in KOLE's technique. According to this modification, supraapical osteotomy was replaced by supraapicalcorticotomy. In 1983, Frost described the concept of Regional Accelerated Phenomenon (RAP). On the basis of this phenomenon, WILKO IN 2001 proposed the accelerated osteogenic orthodontics technique (AOO) through their two case reports. They reported that for the movement of teeth, design of cuts are not significant, rather the degree of metabolic alterations in that particular region is important. In 2001, the two wilko brothers (orthodontist and periodontist) proposed the use of bone graft along with corticotomy to enhance bone volume and formation. They renamed this technique as periodontally accelerated osteogenic orthodontic (PAOO) technique. In 2006, Germec used monocorticotomy technique in which the osteotomy cuts are not placed in the difficult lingual or palatal areas which in turn reduce surgical time as well as patient

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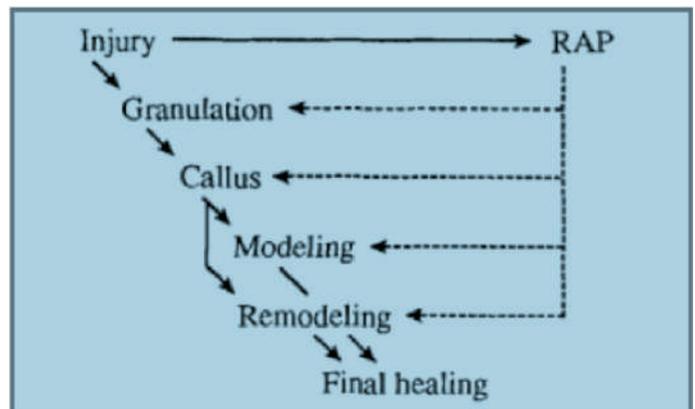
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discomfort. Later on few more advances and modifications were introduced which will be discussed later in the article under advances section (6).

**Principle of corticotomy/ PAAO technique(7):** The roots of corticotomy procedure lie in the regional acceleratory phenomenon (RAP) firstly described by an orthopaedic surgeon HAROLD FROST (1983). It is a local response of bony tissue to the noxious stimulus applied on it which increases the formation of bone 2-10 folds than the normal bone formation. This in turn fastens the healing of bone. It starts few weeks after the surgery, peaks at 12 months and takes around 6-24 months to subside. This phenomenon lasts for about 4 months in the bone.

During RAP, initially demineralisation takes place which helps in the faster movement of tooth supported by orthodontic forces. As RAP starts dissipating, the bone begins to take its normal form and an environment is created which results in remineralisation of the bone.



**Regional Acceleratory Phenomenon (RAP): Frost (1989)**

**Histological and Clinical Fundamentals:** There are four types of surgical damage which can be created in alveolar bone:

- a. Osteotomy (complete cut through cortical and medullar bone),
- b. Corticotomy (partial cut of cortical plate without involving medullar bone),
- c. Ostectomy (removal of an amount of cortical and medullar bone) and
- d. Corticotectomy (removal of an amount of cortex without medullar bone).

**Corticotomy**-assisted orthodontics has been shown to decrease the duration of orthodontic treatment. Reduction of treatment

time by one-third compared with conventional treatments has been shown by various clinical. It is based on the regional acceleratory phenomenon (RAP) which is a local response of tissues to noxious stimuli which promotes tissue regeneration. There is increased osteoclastic and osteoblastic activity along with increased levels of local and systemic inflammation markers in the areas around surgical cuts which extend to the marrow. This response is directly proportional to the magnitude of the stimulus, and is known as physiological “emergency” mechanism. RAP remains for 4 months in human bone. This phenomenon enhances bone healing by 10–50 times than normal bone (8).

### Healing Phases of RAP (studied in Rat Tibia)

There is formation of woven bone which begins in the periosteal area and then extends to medullar bone. Its maximum thickness is achieved by day 7. This woven bone provides mechanical stability to the bone after injury. From day 7, the woven bone in the cortical area undergoes remodeling to lamellar bone and woven bone in the medullary area undergoes resorption, which results in transitory local osteopenia (9).

Clinically, bone resorption results due to the exposure of bone after flap reflection. The degree of resorption was greater in the lingual plate than buccal, and reaches maximum in 3 weeks post-surgery in rats. Transient osteopenia in alveolar bone reduces the biomechanical resistance and causes rapid tooth movement through trabecular bone (10). Transient osteopenia have to be prolonged by orthodontic forces due to limited window period that limits the RAP over a range of period of 3–4 months. This is the reason to adjust the orthodontic appliance in every 2 weeks (11).

Hyalinization (tissue necrosis) is caused due to excessive compression of the PDL caused by excessive pressure. This hyalinized tissue attracts neutrophil, granulocytes and macrophages by chemotaxis and must be removed and remodeled before starting bone resorption by osteoclasts and subsequent orthodontic tooth displacement. When the PDL is compressed, the vascular access of osteoclasts to the PDL–lamina–dura interface is limited. Prolonged hyalinization of the PDL results in slower tooth movement. This period of hyalinization has been called as the lag phase or arrest phase (12–13). Von Böhl et al. reported that hyalinized areas appear between 4 and 20 days and between 40–80 days of tooth movement as a continuous process. This leads to direct bone resorption and faster tooth movement. The rate of tooth movement directly related to force magnitude, type of movement (bodily tooth or tipping movement) or the individual bone metabolic capacity (bone density, systemic and genetic factors). It was suggested that corticotomy results in opening of underlying marrow vascular spaces, which enhances healing potential, and maintains the segment in a stable position, thus creating a demineralized region. Bone block movement forms a dynamic microenvironment just like distraction osteogenesis, but does not cause regional demineralization in medullar bone (14).

Some amount of root resorption is generally expected with any type of orthodontic tooth movement, and its extent depends on the duration of force application. Ren et al. found that the rapid tooth movement after CAO in beagles is not associated with severe root resorption or irreversible pulp damage. Some mild root resorption was reported after 4 weeks, which was partially repaired by week 8 (15).

It was also reported that corticotomy causes greater degree of tooth movement, four-times rapidly in the maxilla and two times in the mandible, compared to traditional orthodontic movement. More cellular activity was observed at corticotomy sites. Osteoclasts, fibroblasts, cementoblasts, and osteoblasts in the PDL are very active on both the tooth and bone surface. This increased cellular activity last for 8 weeks, and after a further 6 months this high activity of cells starts decreasing markedly

which results in dense bone matrix (16).

One more histological study in rats concluded that there was increased turnover of alveolar spongiosa immediately adjacent to the decortication areas, without any orthodontic force being applied. Trabecular bone surface area decreased to half and periodontal ligament surface area increase by two times. Catabolic and anabolic activities were increased by three times at 3 weeks after surgery which decreases gradually until the 7th week and then reached at steady-level by the 11th week after surgery (17)

### Systemic Effects of RAP:

Mueller et al (1991) studied the effect of RAP on systemic bone metabolism in animal model of rat and reported that there is increased formation and mineralisation of bone when tibia and femur of rat were injured with bur (18)

Schilling et al (1998) also reported increase in systemic inflammatory mediators in association with local RAP (19)

Thus split mouth study between corticotomy assisted orthodontic treatment and conventional orthodontic treatment is not suitable as the effects of RAP is not limited upto surgical site only.

### Indications

#### Orthodontic Indications

- Class-I and class-II malocclusions
- Crowding
- Intrusion of molars
- Distalisation of molars
- Cooperative patients

#### Periodontal indications

- Healthy periodontium
- Minimum bone loss
- Not worse than grade-I furcation involvement
- No Temporomandibular joint problems

#### Contraindications

- Ankylosed teeth
- Impacted teeth
- Class-III malocclusion
- Periodontally compromised teeth with active periodontal pathologies and gingival recession.
- Medically compromised patients.
- Uncontrolled osteoporosis or other bony pathologies. (20)
- Patients on immunosuppressive and anti-inflammatory drugs. (20)
- Patients on bisphosphonate therapy. (20)

#### Advantages

- It increases the remodelling of trabecular bone by increasing catabolic as well as anabolic activity at the corticotomy site (21).
- It accelerates the movement of teeth. Bhattacharya et al (2014) conducted a study on 20 patients and concluded that corticotomy assisted orthodontics accelerate the teeth movement and increases the alveolar bone thickness as well (22)
- Corticotomy assisted orthodontic treatment results in 50% less chances of root resorption on completion of treatment when compared with conventional orthodontic treatment (21).
- Evidences suggest that the corticotomy facilitated orthodontic treatment rapidly displays the desired results and thereby reduces total treatment time as compared to conventional orthodontic treatment (21)
- Prolong retention and less chances of relapse have been claimed with corticotomy (21)
- Reduces the need of extractions (21).
- Expansion of narrow arches can be obtained safely (21).
- More bone volume due to addition of bone graft (20).
- Reduces the need of heavy orthodontic appliances like

headgears and expansion appliances (20).

### Disadvantages

- Invasive procedure (20)
- Postoperative complications may include swelling, pain and facial edema. (23)
- Slight interdental bone loss and gingival recession may occur postoperatively (23)

### Evidences of Clinical Implications of Corticotomy:

#### Animal Researches

- Duker (1975) for the first time conducted experiments on beagle dogs and concluded that there is no harm to periodontium and pulp by corticotomy procedures (24).
- Cho et al (2007) conducted protraction of third premolars and found out increase in cellular activity of the formative and resorptive cells (25).
- Iino et al. (2007) concluded that there was rapid orthodontic movement of tooth in initial stages of the treatment when corticotomy was performed in beagle dogs. Decrease in hyalinization of the periodontal ligament was suggested for this finding (26)
- Similarly Mostafa et al (2009) suggested that there was increased pace in the orthodontic treatment when corticotomy assisted orthodontic treatment was compared with conventional orthodontic treatment alone in experimental dogs (27).
- Irfan Qamruddin et al (2015) in a systematic review suggested that corticotomies, low level laser therapy and mechanical vibrations are the emerging techniques to be used as an adjunct to orthodontic treatment. (28)

#### Human Researches

Currently the evidences are mainly available in the form of case reports.

- Wilco et al (2001) reported the series of 3 cases where they suggested various advantages of the corticotomy facilitated orthodontic treatment which included rapid tooth movement, less root resorption, shortened treatment duration, possibility of non-extraction cases, etc (29).
- Long et al (2012) systematically reviewed the procedure and found that its safe and should be incorporated into clinical practice (30).
- Laura Fernandez-Ferrer et al (2016) conducted a systematic review and concluded that corticotomy assisted orthodontics reduces the treatment time and no periodontal damage was found in the included short term studies. (31)

#### Evidences on Limitations of the Corticotomy Procedure

- Reichenbach (1965) suggested the possibility of formation of the pocket and necrosis of alveolar bone caused by corticotomy.
- Bell & Levy (1972) called corticotomy as destructive procedure (32).
- Recently Cassetta et al (2012) reported increased oral health impact profile scores which indicated that the subjects faced functional disabilities (33).

#### Technique

Orthodontic appliances are given 1 week prior to the surgery.

#### Surgical phase involves following 5 steps (6)

**1. Raising the flap:** Proper flap design is essential for access of bone wherein corticotomy has to be performed. Administration of local anaesthesia should be followed by raising the full thickness flap buccally and lingually by giving crevicular incisions<sup>2</sup>.

**2. Decortication:** vertical cuts are made in the interproximal area penetrating into the cortical bone and horizontal cuts are given joining the vertical cuts in the subapical region. These cuts should be deep enough to initiate the regional acceleratory phenomenon. Care should be taken that these cuts do not lead to movable bony blocks or injure any blood vessels or muscle attachments.

**3. Particulate grafting:** synthetic grafts (allograft, xenografts, alloplasts or the combinations of these) can be placed at the surgical site in order to increase the bone volume and facilitate the rapid healing of the bone. Excessive amount of graft can interfere with the healing.

**4. Closure:** flaps should be approximated and sutured atraumatically with 4-0 suture. Interdental papilla should be preserved. Analgesics and antibiotics are prescribed followed by suture removal after 7 days.

**5. Orthodontic force:** Orthodontic treatment is resumed in 2 weeks post-surgery. Patient should be examined for periodontal health and oral hygiene status in every 3 months interval.

#### Other Methods to Accelerate the Orthodontic Treatment (34-43)

1. Surgical Methods

2. Mechanical stimulation methods.

3. Pharmacological method

**1. SURGICAL METHOD:** It is mainly indicated in adult patients with the aim of reducing total treatment time. The basic principle behind this method is to increase the bone turn over by injuring the bone through corticotomy and fractures. Corticotomy and piezoelectric methods are used for this purpose. Details of this method are discussed further in the article.

a) Cyclic forces: In this method light alternate forces are placed using mechanical radiations. Vibration impulses ranging from 20-30 Hz are applied for 20 minutes every day on the teeth which causes the movement of teeth at a rate of 2-3mm/ month. The commercial device 'ACCLEDENT' is commercially now available for applying such forces.

Chung How Kau et al studied the clinical effects of a cyclical force generating device on tooth movement and overall orthodontic treatment time. The levels of patient compliance and patient satisfaction were evaluated. Patients undergoing active orthodontic treatment were included in the study. The patients were instructed to use the device for 20 minutes daily for a period of 6 consecutive months. Rates of tooth movement, patient compliance, and patient perception data were evaluated. The patient compliance rate indicated 67% compliance rate. Overall patient satisfaction with the device increased over the course of treatment time for most variables as indicated by the mean scores. Authors concluded that the rates of teeth movement were increased with the use of the device; patient compliance was 67%; and patient acceptance and compliance with the device was clinically significant.

b) Low level laser: Saito and Shimuzi found that the low level laser therapy cause bone regeneration. They enhance proliferation of osteoblasts, osteoclasts, fibroblasts and thus causing increased bone formation. Various reserchers have tried variable wavelength, frequency and power of low level laser required for increasing the rate of tooth movement. Recently, Gauri Mehta et al (2013) conducted a split mouth study where they applied diode laser at wavelength of 800 nm for 10 secs on the canine region at the experiment site. They have found significant increase in rate of movement of teeth on the experiment side when compared with control side with the mean increase of 54% and 58% in maxillary and mandibular arch respectively.

c) Piezoincision: Dibart et al (2009) introduced the corticotomy by piezoincision technique in order to decrease the patients' morbidity. Surgery was planned 1 week after the placement of fixed orthodontic appliances. After administration of local anaesthesia, vertical gingival incisions with scalpel no 15 under interdental papilla, mostly in attached gingiva, deep enough to penetrate periosteum and contacting the cortical bone were placed only buccally. Through these incisions ultrasonic tips were used to perform the corticotomy cuts (depth – 3mm) on the cortical bone. Areas requiring bone augmentation need to be

tunnelled. With the help of elevators, space is created between the incisions to place the graft material. Suturing is required only to stabilize the graft. Advantage of the technique is less invasive and does not require suture placement which further increases the acceptance of the procedure by the patient. Blindly performed incisions and corticotomies can cause root damage which is a limitation of this technique. In order to overcome this limitation, Jorge et al (2013), proposed the use of metal wire as a guide for placing gingival incisions and corticotomy cuts. Radiographs with the metal wires ensure the correct placement of incisions and cuts and prevents the root damage.

Jianru Yi et al (2017) in their systematic review on use of piezoincision technique for accelerating tooth movement concluded that there are weak evidences in support of its usage. Additionally they supported that there is no harmful effects on periodontal health and no negative effects on pain perception in short term. Due to non-standardization of available studies, the effect on root resorption, anchorage and patient satisfaction remain inconclusive.

d) Microosteo-perforations: The invasive nature of surgical irritation of bone was attempted with a device called Propel, introduced by Propel Orthodontics. The process was called as Alveocentesis, which means to puncture the bone. It consists of

- An adjustable depth dial: The adjustable depth dial can be adjusted to 0 mm, 3 mm, 5 mm and 7 mm of the depth of puncturing the bone based on the required depth of operation. In the anterior region, the depth of puncturing the bone is 3 mm, in premolar region, it is 5 mm, and in the molar region, the depth is 7 mm
- An indicating arrow on the body of the device.

Alikhani studied the effect of micro-osteoperforations on the rate of tooth movement and the expression of inflammatory markers. They selected 20 adults with Class II Division 1 malocclusion and divided into control and experimental groups. Maxillary canines were retracted in both the groups, and movement was measured after 28 days. The expression of inflammatory markers was measured in gingival crevicular fluid. Pain and discomfort were monitored with a numeric rating scale. Micro-osteoperforations significantly increased the rate of tooth movement by 2.3-times along with significant increase in the levels of inflammatory markers. The patients reported no significant pain or discomfort during or after the procedure, or any other complications and thus they concluded that micro-osteoperforation is an effective and comfortable for rapid tooth movement and thereby reducing the treatment duration.

e) Minimally Invasive Rapid orthodontic Procedure (MIRO): It results in speedy orthodontics described by Jorge et al. in 2013. As it is flapless, it reduces both trauma and convalescence. Corticotomy can be carried out with the help of radiographs and surgical guides so that vital structures can be saved.

2. Mechanical stimulation methods: These methods are less invasive as compared to surgical methods. These methods include direct electric current, resonance vibrations, static magnetic field, low level laser therapy, pulsed electromagnetic field, etc. It is based on the principle of bioelectric potential. Through these methods there is generation of bioelectric field leading to negative and positive charges on the bone. Negative charges on concave side of bone attract osteoblasts whereas positive charges on the convex side of the bone attract osteoclasts.

### 3. Pharmacological Methods

Drugs which have been tried to increase the movement of teeth are vitamin-D, prostaglandins, parathyroid hormone, interleukins, mesopristol etc. These drugs have variable effects on the bone and adverse effects systemically so till date no single drug has been proved to be a choice for accelerating tooth movement.

a) Vitamin-D: 1,25dihydroxycholecalciferol regulates the

homeostasis between calcitonin and parathyroid hormone which are found to influence the bone apposition and resorption. Collins et al (1988) conducted an experiment on rats to study the influence of vitamin-D on orthodontic treatment and found that there is 60% rapid movement of teeth when compared with control. Histologically, increased presence of osteoclasts resulting in more bone resorption on the pressure side was found.

b) Parathyroid hormone: Soma et al (1999) have shown the effects of parathyroid hormone on teeth movement in an animal study of rats. They observed that there is increase in the teeth movements by 2-3 folds due to increased recruitment of osteoclasts on the pressure side of the periodontal ligament causing enhanced resorption of bone.

c) Relaxin: Liu et al (2005) observed the effects of administering the relaxin hormone on teeth movement in rats and concluded that it can enhance the teeth movement in early stages of orthodontic treatment.

d) Osteocalcin: Hashimoto et al and Kobayashi et al studied the effect of administering the osteocalcin on the tooth movement and found that it increases osteoclasts and trap- positive multinuclear cells in the early phases of orthodontic treatment.

### Future Prospectives

Animal researches are carried worldwide to improve the orthodontic treatment by administration of biomolecules like parathyroid hormone, relaxins, vitamin-D3, etc. human studies are very scarce in this aspect as long term side effects are yet to be found out. Low level laser therapy is one of the promising approaches in future of orthodontics as it has advantage of being less invasive, painless and more patient cooperation and comfort towards the treatment. Long term clinical trials are required to draw a definitive conclusion. Surgical approach is definitive but it is invasive, may lead to some reversible complications and this makes it a less chosen option among the patients. Piezoincision is also one of the most accepted techniques and hold good results in future.

### Level of Acceptance By Patient

Khalid H Zawawi (2015) studied patients' acceptance of corticotomy-assisted orthodontics. He prepared the two sets of questionnaires of which first one included questions about the age, sex, level of education and few questions about the orthodontic treatment. Second set contained the questions regarding corticotomy assisted orthodontics. Before answering second set of questions, patients were educated with a short description about the corticotomy procedure with the help of clinical photographs. Out of 150 subjects, 129 agreed for answering the questions (72 male and 57 female). Out of these, 7.8 % were in favour of corticotomy in place of extraction. The reason for not selecting corticotomy procedure was most commonly fear from surgery followed by fear from pain. Prior knowledge of the procedure and level of education didn't make any significant difference in the results. Author concluded that the acceptance for corticotomy procedure as an adjunct to orthodontic treatment was low. Fear from the surgery was the most common reason for low acceptance. Patient's level of education or sex did not influence the level of acceptance (44).

### Conclusion

Corticotomy assisted orthodontics can be considered a major breakthrough especially in case of adult orthodontics. It can be a promising mode of treatment for both clinician and patients in future. Various advantages served by it must be taken into consideration. Long term research trials are necessary to be conducted before introducing it into regular clinical practice. Efforts and trials should also be there to limit its limitations.

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References are available on request at [editor@healtalkht.com](mailto:editor@healtalkht.com).

# Recent Advances in Dental Implants

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## Abstract

Dental implant treatment is gaining increasing acceptance by Patients. There is wide acceptance in the adopting a minimal invasive approach on restorative dentistry and when combined with the improvement in reliability of implants, dental implant treatment has been transformed from the last choice to the first choice of treatment being offered to patients. With the increasing research both in basic science and clinical trials coupled with improvement in dental implant designs, the success rate of the dental implants has been steadily improving to over 95%. The success rate is better in denser bone and particularly in the anterior mandible; the success rate reaches 99%. The critical factors of success in the dental implant treatment are related to the training of surgeons, the design of implants, the intra-operative control of implant placement, the consideration of the occlusal loading and the long term maintenance. The present paper reviews the recent advances in the field of implantology.

**Key Words:** Implant, clinical trials, design, occlusal loading, implant placement.

## Introduction

Dental implants (also known as oral or endosseous implants) have greatly evolved over the past 20 years. The idea of permanently being able to replace teeth has been a desire of civilizations since the days of the Egyptians. The most common cause of teeth loss is periodontitis, and other causes include dental caries, trauma, developmental defects, and genetic disorders [1]. The use of dental implants to rehabilitate the loss of teeth has increased in the last 30 years. Before dental implants, dentures and bridges were used, but dental implants have become a very popular solution due to the high success rate and predictability of the procedure, as well as its relatively few complications. Today our modern-day methods of dental implantation are much more successful and painless than attempts from 3000 years ago.

In this paper, recent advances in the field of implantology has been summarized in the following sections (Implant surface, sinus lifting short implant, All on four, Tilted and zygomatic implants, immediate loading versus conventional loading, Peri implant surgery and Image-guided implantology).

### Difference between Implant and Natural Teeth

Implants are basically different from natural teeth starting from composition to the vascularity. The implant behaves as an ankylosed unit, whereas the natural teeth show physiologic mobility by the viscoelastic properties of periodontal ligament. There is no proprioception with respect to implants due to the absence of ligament receptors. Adaptive capacity in case of implants is less compared to natural tooth where the width of the ligament helps in mobility with increased occlusal forces [1]

Gingival fibres are inserted into the cementum above the crestal bone, whereas there is no collagen fibre attachment in case of implants. There is less vasculature in the gingival tissue surrounding the dental implants compared to natural teeth. This reduced vascularity together with parallel oriented collagen fibres adjacent to the body of any dental implant makes implants more vulnerable to bacterial insult [2, 3].

Oral implants when evaluated after 10 years of service do not surpass the longevity of natural teeth even of those that are compromised, for either periodontal or endodontic reason. Proper evaluation, monitoring and maintenance is essential to ensure the longevity of the dental implant and its restoration by combining regular check up, professional care and effective home care.[3,4]

### Recent Advancements

**Implant surface:** Modification of the implant surface has been studied and applied to improve biological surface properties

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favoring osseointegration. The surface roughness of implants has been increased by various methods such as machining, plasma spray coating, grit blasting, acid etching, sandblasted and acid etching (SLA), anodizing, and biomimetic coating. The key factor in implant osseointegration is surface roughness, which shows increased osteoblast activity at 1 to 100 µm of the surface roughness compared to a smooth surface. It is believed that rough surfaces have better osseointegration than smooth surfaces, but the results of the research have been diverse and it is not clear that multiple treatments provide better predictive results.[5]

The machined implant surface is the first-generation implant surface design with a turned surface implant. Plasma spray coating generally forms a thick layer of deposition such as hydroxyapatite (HA) and titanium by spraying a material dissolved in heat on the surface of the implant. Grit-blasting is a process of spraying particles onto the surface of the implant using ceramic material or silica. Sand, HA, alumina or titanium dioxide (TiO<sub>2</sub>) particles are used and acid etching is performed to remove the remaining blasting particles. Acid-etching is the roughening of the titanium implant surfaces using strong acids such as hydrofluoric acid (HF), nitric acid (HNO<sub>3</sub>), and sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) or combinations of these acids. SLA is acid etching after sandblasting with 250–500 µm large grit particles. Anodizing is the dielectric breakdown of the TiO<sub>2</sub> layer by applying an increased voltage to generate a micro-arc. This process forms a porous layer on the titanium surface.[6]

**Sinus lifting:** In the immediate time period after maxillary posterior tooth extraction, initial decrease in alveolar width is by resorption and/or loss of buccal bone. With continuous bone remodeling, absence of stimulation, loss of bone height, and density leads to an increase in antral pneumatization. The maxillary sinus pneumatization is caused by progressive hollowing out of alveolar process of apical aspect mediated by osteoclasts and by increase in positive intra-antral pressure. In such a situation, the residual vertical bone height is decreased making standard implant placement difficult. To adapt, circumvent, and treat this local physiological as well as

anatomical limitation; maxillary sinus floor elevation has become an important preplacement procedure in dental implant treatment planning. Various methodologies have evolved to increase the thickness of maxillary sinus floor. The treatment goal of all such procedures is to increase residual bone height. Few of the techniques involve simple, minimal elevation of maxillary sinus membrane, Schneiderian membrane, while others include placement of various types of grafts including allografts, autografts, bone morphogenetic proteins, and hydroxyapatite crystals. The factors that contribute to survival rate of sinus augmentation and dental implant placement are still the subject of discussion.[7]

**Short implant:** In an atrophic alveolar ridge, there are many anatomical limitations (maxillary sinus, nasal floor, nasopalatine canal, inferior alveolar canal) that make placement of a standard implant difficult. To overcome these limitations and vertical bone deficits, additional surgical procedures, such as guided bone regeneration, block bone grafting, maxillary sinus lift, distraction osteogenesis, and nerve repositioning, are performed to place a standard implant. However, the procedure is sensitive, challenging, costly, and time-consuming and increases surgical morbidity and causes many complications such as sinusitis, infection, hemorrhage, nerve injury, and gait disturbance.[8]

Short implants are considered to be simpler and more effective by reducing the likelihood of such complications, patient discomfort, procedure costs, and procedure times in rehabilitation of the atrophic alveolar ridge. The term of a short dental implant is subjective, and there is no clear criteria for the length of a short dental implant. Some articles defined 10 mm or less as the criterion of a short dental implant, and some defined less than 10 mm as a short dental implant. Some defined the short implant as 8 mm or less. Implant companies have recently offered short implants of less than 8 mm. In this paper, a short dental implant was defined as less than 8 mm, which is similar to other papers.[9]

**All on four:** The all on four for edentulous jaws has been developed to make the best use of available bone and to allow for immediate function using only four implants in edentulous jaws, the solution takes advantage of the benefits of tilting the posterior implants to provide a secure and optimal prosthetic support for a prosthetic bridge (even with minimum bone volume), that can be fabricated and functioning within just a few hours after surgery.[2]

**Tilted and Zygomatic implants:** The use of a tilted (angulated) implant in the posterior maxilla was suggested to avoid sinus augmentation. In this study, an evaluation was made to compare the efficiency between tilted and axial implants with no sinus grafting. After 5 years of follow-up, the implant success rate was 95.2% (survival: rate 100%) for the tilted implants and 91.3% (survival rate 96.5%) for the axial implants. The average marginal bone loss was 1.21 mm for the tilted implants and 0.92 mm for the axial ones.[10]

Zygomatic implants offer another option treatment modality to sinus augmentation. Almost similar to transsinus tilted implants, zygomatic implants are long implants that pass through the sinus or laterally to the sinus. The difference was the anchorage position. While the tip of a trans-sinus tilted implant is positioned in the bone between the anterior sinus wall and the nasal cortical bone, a zygomatic implant will anchor itself into the zygomatic process for stability.[11]

## Immediate loading versus conventional (delayed) loading

According to many previous studies, many researchers believed that after implantation in the jaw for a future prosthesis, titanium implants should be left submerged to undergo a healing process before they are capable of functional loading. This healing process, which is called osseointegration, could be completely achieved in a period from 3 to 6 months. The reason for the delayed loading was to avoid micro-movement on the implant, which could interfere with the healing process. If this situation occurs, connective tissue can develop at the interface between the implant surface and the bone. The result would be failure of the implant due to not being able to resist the masticatory forces [12]. It was suggested that it would be possible to reduce the period between implantation and the placement of prosthesis. Over the past 20 years, a number of studies and trials have reported similar results with trans-mucosal implants compared with submerged implants. As a result, it is not necessary to submerge the implants under the mucosa during the healing period, which eventually introduced the immediate loading protocol [13].

This protocol was initially developed for the treatment of edentulous patients, and its main purpose was to restore immediate function and aesthetics, which are usually the main concerns of patients.

Numerous recent studies that focused on this concept have shown excellent results because the primary outcome was survival of the implant.

A 100% survival rate was reported in 11 edentulous patients treated with immediate full-arch implants [14]. A systematic review reported a survival rate of 98.2% in the immediate loading versus 99.6% in the conventional loading when reviewing 29 randomized control studies [15].

This trend could also be found in many studies that focused on edentulous cases. When immediate loading four implants with a pre-existing denture converted to a fixed dental prosthesis compared with conventional loading (3–6 months), it was reported that the same change of 1.2 mm in marginal bone over 5 years in both groups was observed. Also an insignificant difference in mean MBL between the two treatment modalities in both late and immediate inter-antral implantation in the nonaugmented edentulous maxilla was reported [16]

## Peri implant surgery

The loss of teeth will result in a concomitant resorption of the alveolar bone and with time, there may be insufficient bone height or width for the placement of implants and this is being known that adequate implant length and width are important to improve the longevity of dental implants. Various bone augmentation methods from simple onlay bone graft for small depression, inlay bone graft for sandwich osteotomy to the maxillary sinus floor augmentation are developed for enhancing the bone volume. One of the newest procedures for augmenting areas of bone is called distraction osteogenesis. Osteoinductive and osteoconductive substances are now available to assist in accelerating healing and present great promise for future applications. When there is a lack of soft tissue due to atrophy or from ablative surgery, vestibuloplasty and palatal graft transplant are gaining wider acceptance. The use of free gingival graft transplant has been developed and was found to be technically easier and produced less morbidity to the patients. Different peri-implant surgeries may be combined to treat the problems related to either the bone

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or soft tissue deficiency around the implant placement and in implant maintenance.[17]

### Image-guided implantology

The placement of dental implants requires meticulous planning and careful surgical procedures. A radiographic prescription is often needed to provide a more complete visualization of the current clinical situation and to guide in further clinical steps. A revolutionary development in field of imaging now allows a real-time navigational implant surgery[18] wherein the implant surgery is guided by an on-screen computer guidance thereby allowing easy intra-operative adjustments. However, a major drawback is an expensive machine and long hours of calibration may be needed. Another option available is the use of stereolithographic surgical splints which help to place implants at the predetermined sites. This greatly enhances the speed of implant placement and reduces the chair side time. However, any error in the planning or fabrication of the splint cannot be corrected by the surgeon unless he abandons the use of the splint.[19]

### Conclusion

Recent findings about surface modifications, immediate loading, short implants, sinus lifting, and custom implants have improved the success rate of implants regarding. However, there are limitations due to the lack of long-term or clinical studies. A long-term clinical trial and a more predictive study are needed.

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# Comparative Evaluation of Retentive Levels of Fluoride in Saliva Following Toothbrushing with Sodium Fluoride and Fluoride Containing Bioactive Glass Dentifrices in Children - An Vivo Study.

Dr. Aditi Garg<sup>1</sup>, Dr. M. Ganesh<sup>2</sup>, Dr. Vasudha Sodani<sup>3</sup>, Dr. D.N. Kamala<sup>4</sup>

## Abstract

**Introduction:** Fluoridated toothpastes are one of the best sources of fluoride which effectively protects both deciduous and permanent teeth from caries. The different forms of fluoride available in toothpastes differ in the mechanisms by which they protect against caries. The fluoride concentrations in saliva and dental caries have been reported to be inversely related to the efficiency of caries prevention. With the help of newer fluoridated toothpastes effective caries prevention can be obtained by retention of fluoride in saliva for a longer duration of time.

**Aim:** The aim of this study is to evaluate the fluoride retentive levels in saliva following tooth brushing with two different types of fluoridated toothpastes namely Sodium fluoride (NaF) and fluoride containing bioactive glass and their efficacy in caries prevention. **Methods and materials:** Thirty children in the age group of 3 to 6 years were randomly assigned into two groups as follows: Fifteen children using dentifrice containing 500 ppm of NaF (Colgate for kids) which is the control group and fifteen children using dentifrice fluoride containing bioactive glass (Elsenz) which is the test group. Salivary samples were collected prior to brushing, at an interval of 30 minutes and at an interval of 1 hour respectively and then the fluoride levels were determined.

**Results:** The results showed that there is a rise in the salivary fluoride levels at 30 minutes after brushing in both sodium fluoride and fluoride containing bioactive glass groups. However, in the fluoride containing bioactive glass toothpaste group, the salivary fluoride levels were high at the intervals of 30 minutes and at 1 hour individually from baseline, while with NaF group there is a rise of fluoride level at 30 minutes but decreases to the baseline at 1 hour.

**Conclusion:** The study concluded that fluoride containing bioactive glass toothpaste (Elsenz) showed higher salivary fluoride retention at one hour in comparison to NaF containing toothpaste. Thus newer technology BioMinF, fluoride containing bioactive glass dentifrices with lower fluoride content and with long lasting performance should be adapted for pediatric age group.

**Keywords:** Fluoridated dentifrice, sodium fluoride, bioactive glass, salivary retention.

## Introduction

The battle against tooth decay is continued since many decades. Many techniques and materials have evolved during this period to prevent and arrest caries. Fluorides have been proved to be one of the effective means of anticaries agents and its benefits for preventing dental caries have been known for over 65 years<sup>1</sup>. The repeated uses of fluorides are of critical importance for the control and prevention of dental caries in both children and adults. Numerous controlled clinical investigations have consistently demonstrated the cariostatic properties of fluoride provided in a variety of forms<sup>2</sup>. The fluoride levels in the oral cavity are generally relatively low as it is cleared from the mouth due to salivary secretion and swallowing. Therefore the effect of fluoride after using oral care products on bacteria is limited. Regarding its mode of action in caries prevention the consensus today is that fluoride is mainly effective by enhancing the remineralization of initial caries defects and by inhibiting the demineralization that would lead to caries initiation or progression. It should be emphasized that fluoride is effective when present in the oral cavity and not after it has been swallowed<sup>3</sup>.

Fluoridated toothpastes are the corner stone of caries prevention and are the most cost-effective means for the control of dental caries. The fluoride concentrations in saliva and dental caries have been reported to be inversely related to the efficiency of caries prevention<sup>4</sup>. Since tooth brushing with fluoridated toothpastes is the easiest and most logical way to deliver fluoride into the mouth, it is widely used by persons of all ages<sup>5</sup>.

Fluoride in toothpastes comes in various chemical forms, as organic fluoride- amine fluoride and inorganic fluoride- sodium fluoride, stannous fluoride, sodium monofluorophosphate and

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also fluoride incorporated in bioactive glass. In toothpastes, ionically bound fluoride and covalently bound fluoride is used. The different forms of fluoride differ in the mechanisms by which they protect against caries. It is thought that monofluorophosphate exchanges with orthophosphate in the enamel and afterward an intra-crystalline transposition of F<sup>-</sup> and OH<sup>+</sup> takes place, whereby fluorapatite is formed. Therefore, the caries-protective effect is limited by the number of the reactive molecules in the crystal lattice. If MFP is hydrolyzed, then fluoride, which is released, reacts with dental hard tissue like ionic calcium compounds. Ionically bound fluoride is deposited primarily as a CaF<sub>2</sub> layer on the dental hard tissue during brushing. With time, this reservoir is used up and the fluoride concentration of the enamel and saliva increases<sup>4</sup>.

Traditional toothpastes containing NaF, SnF<sub>2</sub>, NaMnFPO<sub>4</sub> when used it showed an immediate 'high' of fluoride in the mouth, but that this drops rapidly as the toothpaste is washed away by salivary flow, so that only 100 minutes the amount of fluoride that remains is below therapeutic levels. Even at high concentrations, the fluoride is rapidly washed away, so the effect is only short term. A further drawback is that high concentrations of fluoride form calcium fluoride (fluorite) instead of fluorapatite, which is

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required for effective remineralization. In large quantities fluoride can form a whitish crust on the tooth surface, which was previously thought to act as a reservoir of fluoride, but research has shown that this is not the case, it is completely insoluble, and does not release fluoride at all. By contrast, the fluoride containing bioactive glass toothpastes (Fluorocalciumphosphosilicate) releases fluoride slowly around 8 to 12 hours and is therefore used more effectively. Bioactive glasses are pH sensitive as they dissolve faster under acidic conditions than neutral or basic conditions. Thus when faced with an acid challenge as a result of bacteria metabolizing sugars, the glass dissolves quickly and releases calcium, phosphate and optionally fluoride ions to minimize the acid dissolution of the enamel apatite crystals. As it dissolves, the glass structure in such toothpastes provides a slow release vehicle for the fluoride, calcium and phosphate together, enabling it to form fluorapatite, which is more stable and resistant to acid conditions.

Keeping this in mind the following study was undertaken to evaluate the amount of salivary fluoride retention following the use of fluoridated dentifrices namely Elsenz toothpaste and Colgate kids toothpaste, thereby promoting the use of alternative fluoridated toothpaste for caries prevention on a mass scale.

### Materials and Method

The following materials were used:-

1. Fluoridated toothpastes:-

(A)Elsenz Toothpaste contains 530 ppm of Fluoride in the form of Fluorocalcium-phosphosilicate (Fluoride containing bioactive glass).

(B)Colgate Kids Toothpaste contains 500 ppm of Fluoride in the form of sodium fluoride.

2. Toothbrush

3. Plastic container (for saliva collection)



Before data collection, the purpose and procedure of the study was explained to the parents of children in the age group of 3 to 6 years from the municipal schools of Ahmedabad district in Gujarat state and written informed consent was obtained from the parent/guardian of each patient. The children underwent a dental

examination performed by a single examiner which involved diagnosis of all the surfaces of the teeth and soft tissues of the oral cavity. The inclusion and exclusion criteria was as follows:- Caries free children; marked intraoral soft tissue pathology; subjects with a history of taking antibiotics 3 months before or during the course of study, medically compromised patients, children undergoing orthodontic therapy respectively.

Children were randomly assigned to two groups as follows:-

1. Control group:- 15 children using dentifrices containing fluoride in the form of sodium fluoride (Colgate for kids)

2. Test group :- 15 children using dentifrices containing fluorocalciumphosphosilicate (Elsenz)

Samples of saliva were collected into plastic specimen containers as whole unstimulated saliva for a period of 2 minutes by spitting method. Baseline saliva sample was collected 2 hours post prandial. Children were instructed to brush their teeth under assistance for 2 minutes. After brushing, the children were instructed to rinse their mouth with 10 ml of tap water for 10 seconds. Further, instructions were given to pool the saliva in the mouth and then expectorate in a sterile plastic container at an interval of 30 minutes and 1 hour. Plastic container was sealed and fluoride analysis was done through HI-729 Fluoride Low Range Handheld Colorimeter, Checker®HC of Hanna instruments. Results were obtained and analyzed. Results of the study were tabulated and evaluated using paired t test and independent t-test using Statistical Package for the Social Sciences (SPSS version 20.0) for Windows. Confidential interval for mean was considered to be 95% and p value <0.05 considered significant.



### Results

There is a rise in the salivary fluoride levels of Fluorocalcium phosphosilicate containing toothpaste at an interval of 30 minutes and 1 hour individually from baseline while with NaF there is a rise at 30 minutes but it decreases to the baseline at 1 hour. Statistically significant results were obtained in both the groups on analysis. (chart 1, chart 2, chart 3).

Comparison of the Fluoride difference in 30 minutes and 1 hour between the two groups shows that F difference is higher in

Elsenz group and is statistically significant with a p value of 0.004 and <0.001 respectively.(table 1, table 2)

Chart 1: Comparison of Fluoride levels at different time intervals of individual group

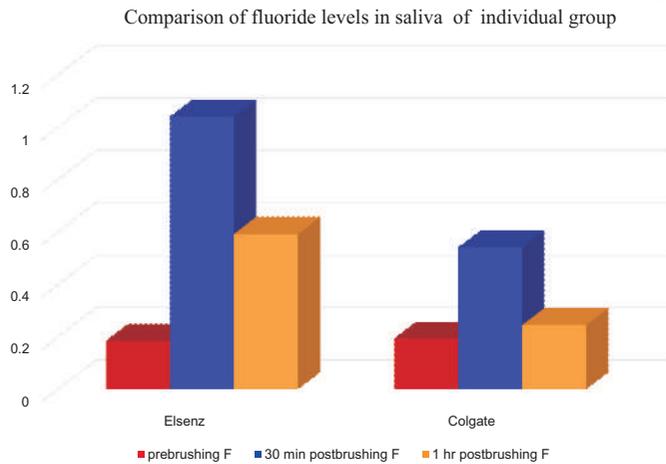


Table 1: p value after paired t test for association of the F levels between time periods of both the groups.

Group	Pair	Time Interval	Mean	Std. Deviation	P value
Elsenz	Pair 1	prebrushing F	0.184667	0.043403	<0.001
		30 min post brushing F	1.04	0.51901	
	Pair 2	prebrushing F	0.184667	0.043403	<0.001
		1 hr. post brushing F	0.592667	0.226856	
	Pair 3	30 min post brushing F	1.04	0.51901	0.006
		1 hr. post brushing F	0.592667	0.226856	
Colgate	Pair 1	prebrushing F	0.193333	0.048206	0.003
		30 min post brushing F	0.542	0.37331	
	Pair 2	prebrushing F	0.193333	0.048206	0.017
		1 hr. post brushing F	0.245333	0.058538	
	Pair 3	30 min post brushing F	0.542	0.37331	0.004
		1 hr. post brushing F	0.245333	0.058538	

Table 1

Chart 2: Comparison of Fluoride levels at different intervals of both the groups

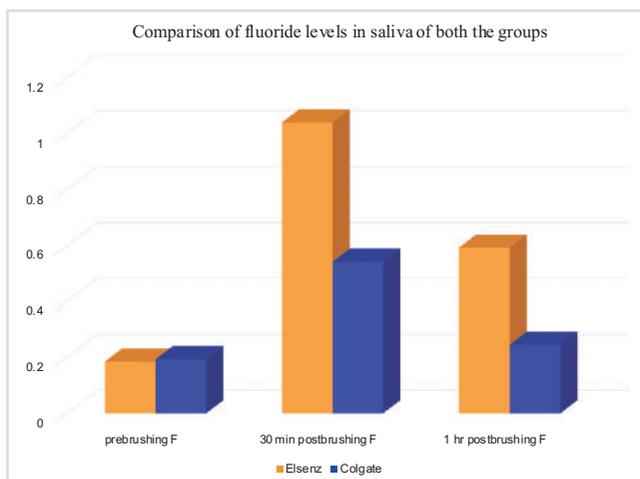


Chart 2

Chart 3: Comparison of Fluoride difference at each time interval of both the groups.

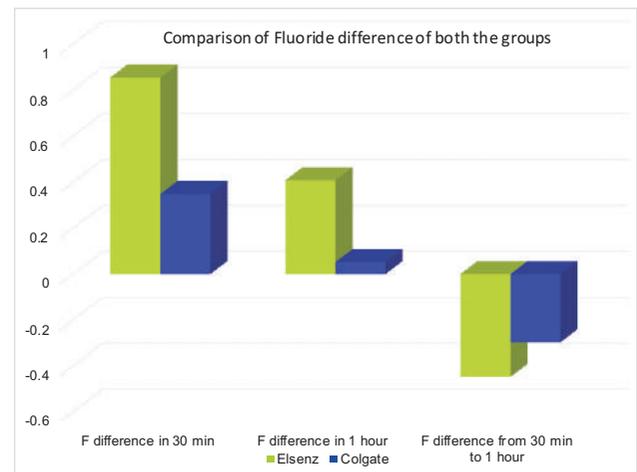


Chart 3

Table 2: p value after independent t test for comparison of two groups

	Group	Mean	Std. Deviation	P value
Pre brushing F	Elsenz	0.184667	0.043403	0.609
	Colgate	0.193333	0.048206	
30 min post brushing F	Elsenz	1.04	0.51901	0.005
	Colgate	0.542	0.37331	
1 hr. post brushing F	Elsenz	0.592667	0.226856	<0.001
	Colgate	0.245333	0.058538	
F difference in 30 min	Elsenz	0.855333	0.499998	0.004
	Colgate	0.348667	0.374163	
F difference in 1 hour	Elsenz	0.408	0.243668	<0.001
	Colgate	0.052	0.074085	
F difference from 30 min to 1 hour	Elsenz	-0.44733	0.533244	0.363
	Colgate	-0.29667	0.338034	

## Discussion

Fluoride concentration in whole saliva has been related to the efficacy of caries prevention. Those forms of fluoridated toothpastes which contain less concentration of fluoride and sustained release in the mouth, stays in the oral cavity for a longer period of time and shows more property of caries prevention and less chances of fluoride ingestion leading to fluorosis.

The source of fluoride plays an important role for the release of fluoride from its reservoir and its retention in saliva. Sodium fluoride (NaF) is instantly dissociating in saliva, Sodium monofluorophosphate (NaMFPO<sub>4</sub>) requires hydrolysis to release free fluoride ions and amine fluoride may bind to organic constituents in saliva and plaque and releases fluoride slower than the other two. Higher fluoride concentrations may result in the formation of a CaF<sub>2</sub> layer on the enamel surface which also may serve as fluoride reservoir. The different dissolution properties of different fluoride formulations may lead to different salivary fluoride concentrations after tooth brushing, consequently affecting the caries protective effect of salivary fluoride content<sup>5</sup>.

## Garg et al.: Comparative Evaluation of Retentive Levels of Fluoride in Saliva Following Toothbrushing with Sodium Fluoride and Fluoride Containing Bioactive Glass Dentifrices in Children -An Vivo Study.

Bioactive glass incorporated with fluoride chemically binds to the tooth surface, releases fluoride, calcium and phosphates ions slowly over several hours into saliva. The ions precipitate and crystallize to form fluorapatite over dentin surface and within dentinal tubules. This sustained release of fluoride ions rebuilds and strengthens enamel<sup>8</sup>. Under normal conditions in the mouth, the hydroxyapatite mineral in tooth enamel is in dynamic equilibrium with the calcium, phosphate and hydroxyl ions in saliva, but under acidic conditions, this equilibrium is shifted, the pH in the mouth falls, and demineralization will occur. As the bioactive glass particles dissolve, releasing phosphate, calcium and fluoride ions to form fluorapatite, the pH will increase. There is an additional 'smart' effect too, during acid attack at lower pH, the glass dissolves faster so that the neutralization effect takes place more rapidly<sup>9</sup>.

The recommended durations for tooth brushing using fluoridated dentifrices, mouth rinsing, and spitting out should be 1-2 minutes, 5 seconds, and once, respectively. Moreover, mouth rinsing should only be performed once using 10-15 ml of water<sup>6</sup>. Sjögren et al found that salivary fluoride levels following tooth brushing decreased 1-2 times after a single rinsing, and 4-5 times after a double rinsing compared to no rinsing<sup>10</sup>. In the present study, for the age group of children between 3 to 6 years fluoridated dentifrices used were in the concentration of 530 ppm (fluoride incorporated in bioglass) and 500 ppm (fluoride content in the form of NaF) and the children brushed their teeth for 1 minute and rinsed their mouth with 10 ml of tap water for 10 seconds. The pre brushing salivary samples were collected 2 hours post prandial and children were instructed not to eat food for an hour post brushing which is similar to a study done by Sjögren et al, who stated that eating immediately after brushing led to a 12-15 times reduction in salivary fluoride levels<sup>10</sup>.

The use of stimulated saliva was considered inappropriate for the present study as stimulated saliva will increase the rate of fluoride clearance and will artificially lower the fluoride levels at subsequent sample points<sup>11</sup>. Furthermore, the fluoride concentration in experimentally stimulated saliva is not a true reflection of the fluoride concentration bathing the teeth, due to the diluting effect of stimulated ductal saliva. The importance of unstimulated salivary flow rate in the clearance of fluoride from the oral cavity was supported in the present study.

In the study done by Sjögren and Birkhed, TISAB buffer solution was added in the collected salivary sample and fluoride analysis was carried out using a fluoride sensitive electrode (ORION 96-09, Orion research, Cambridge, Mass., USA)<sup>12</sup>. While in a study done by Zero DT et al, the sample vials were stored at 4°C for later analysis (no longer than one month) and saliva flow rates were determined by measurement of the volume of each saliva sample by use of an adjustable digital pipette (P-1000, Rainin Instrument Co., Wobum, MA) and calculated in mL/min, the fluoride concentrations found in the test dentifrices, mouthrinse, and saliva samples were determined by a microdiffusion method (Taves, 1968), which measures total acid diffusible fluoride<sup>13</sup>. In the present study fluoride analysis was done through HI-729 Fluoride Low Range Handheld Colorimeter, Checker®HC of Hanna instruments. It is easier to use, more accurate than chemical test kits, dedicated to a single parameter and more convenient due to its small size. It allows immediate fluoride analysis post sample collection and is available to check fluoride in the concentration of 0.00 to 2.00 ppm. Thus more accurate and faster results are obtained.

Mina Hirose et al evaluated sodium fluoride (NaF) and

sodium monofluorophosphate (MFP) tooth pastes on salivary fluoride levels after toothbrushing. The results indicated that the NaF type of dentifrice retains more fluoride in saliva than that of MFP. While in the present study fluoride incorporated in bioactive glass type of dentifrice showed better retention than that of NaF<sup>6</sup>.

In this study there was salivary fluoride retention upto 1 hour with both the toothpastes. While similar study by Ingle NA, Sirohi R, Siwach A with dentifrices containing 458 ppm and 1000 ppm of fluoride showed that there was considerable fluoride retention after brushing with fluoride dentifrices<sup>4</sup>.

In the present study the salivary fluoride level for fluoride incorporated in bioactive glass containing dentifrice is more at 60 minutes interval but for NaF containing toothpaste at 60 minutes interval the levels had reached the baseline levels which is similar to the study done by Nagpal D I, Damle S G for dentifrice containing 1000ppm fluoride and 500ppm fluoride<sup>7</sup>.

In this study long term follow up period for both the toothpastes is required, so as to determine the fluoride retention of NaF containing and fluoride incorporated in bioactive glass containing toothpastes post 1 hour of brushing.

### Conclusion

Fluoride dentifrices have been accepted for their effectiveness in caries prevention and are the most cost-effective means for the control of dental caries. The newer technology dentifrices could be a means of reducing the fluoride content of the toothpastes in children while ensuring adequate concentrations are maintained for longer. Therefore, Fluorocalciumphosphosilicate dentifrices may provide a new direction for caries prevention.

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**Conflicts of Interest:** Nil.

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# MiCroscopic Talk



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## Obstructive Sleep Apnea: An Emerging Problem

Dr. Fahad Wasey<sup>1</sup>, Dr Shoborose Tantray<sup>2</sup>

### Abstract

Obstructive sleep apnea is potentially sleep disorder with multiple of negative consequences on patients health and society .OSA Symptoms include loud snoring, daytime sleepiness and restless sleep. The "gold standard" of detection is by polysomnography, a detailed history and physical examination may help uncover previously undiagnosed cases. Under diagnosed obstructive sleep apnea can cause heart disease, hypertension, depression, and even death. Several other modalities exist for treating obstructive sleep apnea, including continuous positive airway pressure (CPAP), oral appliances and several surgical procedures. Conservative approaches like weight loss, alcohol and tobacco cessation are also strongly encouraged in the patient with obstructive sleep apnea. With increased awareness a multidisciplinary approach is necessary for an accurate management of the disease.

**Key Words:** Apnea, Continuous Positive Airway Pressure(CPAP), Polysomnography, Snoring, Uvulopalatopharyngoplasty .

### Epidemiology

Obstructive sleep apnea (OSA) is defined as the occurrence of at least 5 episodes per hour of sleep during which respiration temporarily ceases<sup>1</sup>. OSA is a common medical condition, More than 85% of patients with clinically significant OSA have never been diagnosed<sup>2</sup>This is thought to reflect the fact that many patients with symptoms of OSA are not aware of their heavy snoring and nocturnal arousals.<sup>3</sup> The cardinal features of OSA include signs of disturbed sleep such as snoring and restlessness, interruptions of regular respiratory patterns during sleep, and daytime symptoms such as fatigue or trouble concentrating that are attributable to disrupted sleep patterns at night. It is estimated that as many as 1 of 5 adults has at least mild symptoms of obstructive sleep apnea, while 1 of 15 has moderate to severe symptoms.<sup>4</sup> Although extensive studies have not been conducted that analyze the variability of OSA incidence by race, data support the fact that the prevalence of OSA is as high, if not higher, among African Americans as it is among Caucasians.<sup>5</sup> Prevalence tends to be lower among people of Asian descent.<sup>7</sup> Most population-based studies support the existence of a two fold to three fold greater risk of OSA in men than in women.<sup>8</sup> Patients aged 65 through 95 years are also at significantly increased risk of developing symptoms.<sup>6,9</sup> With the continuous rise in average life expectancies seen in Western countries, OSA is sure to pose a significant health challenge in years to come.

### Pathophysiology

OSA is caused by repetitive bouts of upper airway obstruction during sleep with a consequent cessation/reduction of the respiratory passages.<sup>3</sup> The most common site of obstruction is mainly the oropharyngeal tract.<sup>10</sup> It is important to differentiate OSA from the less common central sleep apnea, which is caused by an imbalance in the brain's respiratory control centers during sleep. While the pathogenesis of OSA is thought to be multifactorial, anatomic defects are thought to play a major role.<sup>3</sup> Certain physical characteristics that may contribute to OSA include obesity, thickened lateral pharyngeal walls, nasal congestion, enlarged uvula, facial malformations, micrognathia, macroglossia, and tonsillar hypertrophy.<sup>1,10</sup> Obesity contributes to airway narrowing through fatty infiltration of the tongue, soft

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palate, or other areas surrounding the airway.<sup>11</sup> while the patient falls asleep, muscles of the nasopharynx get relax and the surrounding tissue collapses, causing obstruction of the airway.<sup>3,12</sup> As oxygen levels in the body start to drop and carbon dioxide levels rise, the patient is aroused from sleep; this causes an increase in sympathetic tone and subsequent contraction of nasopharyngeal tissue, which allows alleviation of the obstruction.<sup>2</sup>

Upon the patient's falling back to sleep, however, the airway is again subjected to narrowing until the patient is aroused from sleep once again. The cycle continues throughout the night, causing decreased time spent in rapid eye movement sleep and an overall decrease in quality of sleep.<sup>3,12-14</sup> Because of the gravity-dependent factors discussed above, most obstructive symptoms happen in the supine position.<sup>15</sup> Contributing to the anatomic causes of this disorder is a well-defined neural component. Several studies have confirmed that natural responses to negative pharyngeal pressure are already diminished during sleep.<sup>12,16</sup> Furthermore, sleep disruption itself can lead to a further reduction in upper airway muscle activation, causing exacerbation of the aforementioned symptoms.<sup>17</sup> Several studies have also explored the effects of repetitive short cycles of oxygen saturation that are followed by rapid reoxygenation. Periods of hypoxemia inhibit synthesis of nitrous oxide, a potent vasodilator, directly influencing vascular beds. Furthermore, episodes of hypoxia cause activation of various inflammatory cells that are potentially damaging to endothelial cells and predispose patients to the development of atherosclerotic lesions.<sup>2,18</sup>

### Risk Factors

Several factors place patients at increased risk for developing OSA. Genetic factors affecting craniofacial anatomy have been linked with increased risk and severity of disease. Although many

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subtle hard and soft tissue factors (mandibular positioning, abnormal soft palate, tonsillar hypertrophy) can increase a patient's vulnerability for OSA,<sup>19</sup> short mandibular body length seems to have the strongest association with disease.<sup>20</sup> Other risks associated with OSA include nasal congestion, pregnancy, menopause, hypothyroidism, and diabetes. OSA is 3 times more prevalent in patients with insulin resistance than it is in the general population (Figure).<sup>21</sup> Social factors also play an important role in the development of OSA. Alcohol and tobacco use have strong associations with the development and progression of obstructive symptoms.<sup>19</sup> Alcohol, as well as benzodiazepines and other central nervous system depressants, preferentially hamper the upper airway muscle activity and also depressing the respiratory centers of the brain. Tobacco use alone causes a threefold increase in risk of OSA, as observed in smokers compared to nonsmokers.<sup>22</sup> While the conditions discussed above are all known risk factors for OSA, the most widely accepted and researched risk factor is obesity. The Wisconsin Sleep Cohort Study showed that a 1 standard deviation increase in any measure of body habitus is associated with a fourfold increase in OSA disease risk.<sup>19</sup> Excess body weight has been associated with acceleration of OSA, with a reduced time course of progression to moderate or severe disease.<sup>19</sup> Obstructive sleep apnea itself can serve as a risk factor for the progression of other disease processes and should therefore receive careful attention by physicians. One study showed that patients with OSA are more likely to develop higher rates of hypertension, heart failure, arrhythmias, coronary artery disease, stroke, and even death.

### Clinical Manifestations and Diagnosis

A thorough history and physical examination will often elucidate some of the signs and symptoms of OSA. Common symptoms include snoring, awakening from sleep with a sense of choking, morning headaches, fitful sleep, decreased libido, as well as a history of hypertension, cerebrovascular disease, renal disease, diabetes, or gastroesophageal reflux disease.<sup>23</sup> Despite being a defining feature of OSA, alleged absence of daytime somnolence is not sufficient to dismiss the diagnosis of OSA, as often somnolence may go unnoticed or be underestimated because of its chronicity. The nonspecific and variable features of OSA, its diagnosis doesn't depend on the clinician's subjective analysis only.<sup>24</sup> OSA can be measured by using an apnea-hypopnea index, which records the number of times per hour of sleep that a patient experiences an abnormally low respiratory rate or complete cessation of breathing.<sup>9</sup> Typically, an apnea-hypopnea index of 5 or more is sufficient for a diagnosis of OSA. Polysomnography, also known as a "sleep study," is the current "gold-standard" of OSA diagnostic testing. In polysomnography, the patient is kept overnight and is monitored for several physiologic variables in a sleep laboratory. Variables monitored include body position, limb movement, oxygen saturation, cardiac rhythm and rate, respiratory effort, brain activity, eye movements, and stages of sleep.<sup>25</sup> While a positive polysomnography study result reinforces a previous clinical diagnosis of OSA, current literature dictates that a negative

polysomnography result, with strong clinical suspicion of OSA, does not rule out the disease because of the high levels of variability, technician error, and lack of standardization involved in testing.<sup>26</sup> Additional diagnostic modalities for OSA include portable sleep monitors, radiographic studies for anatomic analysis, and empiric treatment.<sup>27</sup> It is important to remember that OSA can occur and progress over relatively short periods of time, and its association with significant morbidity, coupled with the relatively low risk and high reward of therapy, merits a thorough workup and treatment plan.<sup>9</sup>

### Management

Treatment of OSA depends on the severity, duration, and cause of the patient's symptoms as well as the patient's lifestyle and overall health.<sup>28</sup> Nonetheless, certain measures should be undertaken by nearly all persons affected by OSA. Overweight patients should be encouraged to undergo a weight-loss regimen. Studies<sup>25,29</sup> have shown that a 10% weight loss is associated with a 26% reduction in apnea-hypopnea index scores. For severely obese patients, bariatric surgery (i.e, gastric banding, gastric bypass, gastroplasty) may be considered, as studies<sup>30</sup> have shown that symptoms of OSA can be relieved in up to 86% of patients undergoing such operations. Other lifestyle changes that may help modify the signs and symptoms of OSA include cessation of alcohol and tobacco use, as well as the use of a lateral sleeping position.<sup>25,28</sup> Furthermore, the use of benzodiazepines and other central nervous system depressants should be avoided. Despite their proven efficacy, conservative approaches for treating OSA often fall short in providing clinically significant results. Treatment of OSA reduces health care utilization, medical costs, and even mortality.<sup>31-33</sup> Therefore, patients should not shy away from therapeutic options, and medical practitioners should not hesitate to apply treatment regimens in addressing the problem of OSA. First-line therapy for most patients with OSA continues to be the use of continuous positive airway pressure (CPAP). This therapy maintains adequate airway patency; it not only immediately reverses apnea and hypopnea, but it also decreases somnolence and increases quality of life, alertness, and mood.<sup>25,28</sup> However, patient compliance levels average only 50% to 60% because of the frustrations associated with CPAP machines, including mask leaks, nasal congestion, and sleep disruption. More advanced machines such as the bilevel positive airway pressure and automatic positive airway pressure variants remain experimental, as they are more expensive and are not covered by most insurance plans for treatment of OSA. A commonly implemented alternative to CPAP involves the use of oral appliances designed to advance the mandible forward. Such devices decrease arousal and the apnea-hypopnea index while increasing arterial oxygen saturation.<sup>34</sup> Furthermore, patients tend to have a stronger preference for oral appliances.<sup>35</sup> Many clinicians, however, still consider oral appliances to be a suboptimal alternative to CPAP.<sup>25</sup> For those patients receiving little benefit from CPAP or oral appliances, surgery may be considered. The most commonly implemented surgical procedure for treatment of OSA is uvulopalatopharyngoplasty, where the

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palatine tonsils, as well as uvula and posterior palate, are resected and tonsillar pillars are reoriented in hopes of establishing a larger airway.<sup>25</sup> The small number of trials conducted with uvulopalatopharyngoplasty measure the overall effectiveness of the procedure at around 50%. Because the procedure has been associated with complications such as postoperative pain, bleeding, nasopharyngeal stenosis, and vocal changes, patients may explore other surgical options.<sup>25,35</sup> Other techniques used include laser-assisted uvuloplasty, tonsillectomy, hyoid suspension, partial resection of the tongue base, and maxillomandibular advancement.<sup>25</sup> While laser assisted uvuloplasty is the least invasive of the procedures listed, studies investigating the effectiveness of the more invasive maxillomandibular advancement have been promising, with success rates between 75% and 100%.<sup>36</sup> Nasal surgery may be recommended when nasal obstruction or congestion is thought to be the major cause of symptoms.<sup>25,28,36</sup> Tracheotomy is the definitive form of treatment for patients with severe life-threatening sleep apnea who are unresponsive to other treatment options.<sup>2</sup>

### Conclusion

Obstructive Sleep Apnea is an important public health concern. While only 1 in 5 patients has at least mild OSA and only 1 in 15 has moderate to severe OSA, the societal impacts are often much greater. Disturbed sleep patterns lead to increased levels of daytime somnolence, which can cause days of missed work and increased levels of motor vehicle and occupational accidents. Furthermore, as discussed above, OSA can both worsen existing medical conditions and influence the onset of new disease. It is estimated that untreated OSA adds approximately \$3.4 billion annually to health care costs in the United States.<sup>33</sup> Given that the condition is undiagnosed for 85% of patients with sleep apnea, it is important for clinicians and patients alike to recognize and deal with the early signs and symptoms of obstructive sleep apnea.

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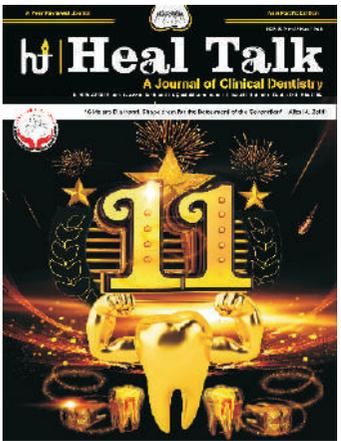
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## SAVE THE

# Girl Child

*'Courage, sacrifice, determination, commitment, toughness, heart, talent, guts. That's what little girls are made of.'* - Bethany Hamilton

The hand that rocks the cradle, the procreator, the mother of tomorrow; a woman shapes the destiny of civilization. Such is the tragic irony of fate, that a beautiful creation such as the girl child is today one of the gravest concerns facing humanity. Women are the most important section of the society and equally participate in the life existence on the earth. However, regular decrease in the sex ratio of female in India because of the crimes against women, it has created the fear of total finish of women. So, it is very necessary to save girl child in order to maintain the ratio of women in India. It has been a most important topic as a social awareness in the Indian society which youths of the country must know about.

Girls are the pillars of our society. A small girl child can be a good daughter, a sister, a wife, and a mother. Yet, she is considered as a curse or a burden rather than a blessing. In India, we worship many female Goddesses at various festivals however a similar treatment isn't given to the women in our homes. At every stage of life she is discriminated and neglected for basic nutrition, education and living standard. When she was in the womb, she was forced to miss the moment when she was supposed to enter the world. At the time of birth her relatives pulled her back and wrung her neck. After killing her she was thrown into a trash can. During childhood, her brother was loaded with new shoes, dresses and books to learn while she was gifted a broom, a wiper and lots of tears. In her teenage, she missed tasty delicious food to eat and got only the crumbs. During her college days, she was forced to get married, a stage where illiteracy, lack of education resulted in high fertility rate, aggravating the condition of females in the country. Again if this female gives birth to a girl child, the journey begins once again.

Dowry death, bride burning, rape, sexual harassment and child abuse, are other evils that still continue against her. India is a fast growing country in every field. It is booming in the field of economy, research, technologies and infrastructure. Even after such witnessed advancements in the country, violence against a girl child is still practiced. The reason of female foeticide is technological improvement in the country such as ultrasound, sex determination tests, scan tests and amniocentesis, detect genetic abnormalities, etc. All such technologies have given way to various rich, poor and middle class families to detect sex of fetus and abort in case of girl baby.

Sex-selective abortion or female foeticide has led to a sharp drop in the ratio of girls born in contrast to boy infants in some states in India. Ultrasound technology has made it possible for pregnant women and their families to learn the sex of a fetus early in a pregnancy. Discrimination against girl infants, for several reasons, has

combined with the technology to result in a rise in abortions of fetuses identified as female during ultrasonic testing.

The trend was first noticed when results of the 1991 national census were released, and it was confirmed to be a worsening problem when results of the 2001 national census were released. The reduction in the female population of certain Indian states continues to worsen, as results of the 2011 national census have shown. It has been observed that the trend is most pronounced in relatively prosperous regions of India. The dowry system in India is often blamed; the expectation that a large dowry must be provided for daughters in order for them to marry is frequently cited as a major cause for the problem. Pressure for parents to provide large dowries for their daughters is most intense in prosperous states where high standards of living, and modern consumerism, are more prevalent in Indian society. Rates of female foeticide in Madhya Pradesh are increasing; the rate of live births was 932 girls per 1000 boys in 2001, which dropped to 918 by 2011. It is expected that if this trend continues, by 2021 the number of girls will drop below 900 per 1000 boys.

India has launched a nationwide campaign named "Beti Bachao-Beti Padhao" (means Save the Girl Child and Educate Her). This campaign was launched to spread awareness in the society against female foeticide as well as women empowerment through education.

Though life for the girl child is steadily improving, many are still subjected to horrific practices, such as female genital mutilation, son preference – often resulting in female infanticide – as well as child marriage, sexual exploitation and abuse. Girls are also more likely to experience discrimination in food allocation and healthcare, and are often outpaced and outranked by boys in all spheres of life.

Freedom from all forms of discrimination against the girl child remains only partly fulfilled, and governments and societies must galvanize efforts if true freedom is to be won. Policies and programmes initiated must be duty-bound to take into consideration the differing, yet critical, needs of the girl child in terms of physical protection from sexual and physical exploitation, discrimination in all forms including in the field of education, and increased awareness of the struggles being faced by girls today.

Following maybe the various effective steps to save girl child:

1. The position of girl child in Indian society is backward since ages because of the extreme desire of parents for the boy-child. It has created gender inequality in the society and has been very necessary to remove by bringing gender equality.
2. Extreme poverty in the society has created

social evil against women as dowry system which worsens the situation of women. Parents generally think that girls are only to spend money that's why they kill girl child before or after birth in many ways (female infanticide, dowry deaths, etc). Such issues need to be removed urgently in order to save girl child.

3. Illiteracy is another issue which can be removed through proper education system for both genders.
4. Empowering women is the most effective tool to save girl child.
5. People should be aware through some effective campaigns regarding save the girl child.
6. A girl child is unsafe inside as well as outside the mother's womb. She has fear in many ways all through the life with the men whom she gives birth. She is ruled by the men whom she gives birth and it is totally the matter of laugh and shame for us. Education is the best tool to bring revolution of saving and respecting a girl child.
7. A girl child should be given equal access and opportunities in every field.
8. There should be safety and security arrangement for girls at all the public places.
9. Family members of a girl child can be better target to make save the girl child campaign successful.

The existence of human race on the earth is impossible without the equal participation of both, man and woman. Both are equally responsible for the existence of human race on the earth as well as growth and development of any country. However, there is no doubt in saying that a woman is more necessary than man as without her we cannot think about the continuation of human race as she gives birth to human. So, girl children are not killed, they should be saved, respected and given equal opportunities to go ahead. They are the source of root creation and help in shaping destiny of civilization. However, women have been the victim of female foeticide, rape, sexual harassment, dowry deaths, etc in her own shaped civilization.

Save girl child is not taken by the people as topic only, it is a social awareness which should be taken very seriously. People should save girl child and respect girl child as they have power to create a whole world. They are equally needed for the growth and development of any country. Each and every citizen of the India must follow all the rules and regulations made for saving the girl child as well as improving the position in the society. Girls should be considered as equal as boys by their parents and given same opportunities in all the working areas.

**Dr Bhavna Jha**



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