



TAPER

Journal of Indian Dental Association Thiruvalla



Volume 4

Issue 1

August 2020

Website: - www.idathiruvalla.org

Email id: - idathiruvalla@gmail.com



CHRISTMAS CAROL



ORAL CANCER DAY



DENTIST DAY CELEBRATION



WOMEN'S DAY CELEBRATION



INSTALLATION CEREMONY

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Did COVID 19 change our outlook???



Covid 19 had divided the world history into 2 halves: life before covid & life after the advent of covid...Will ever our life come back to normal?? This is the most frequent question we ask ourselves now a days. I think we need to change our outlook to cope up with the current scenario. Dentistry is one of the worst affected stream due to SARS-Cov-2. It is causing too much physical and mental agony for each one of us. Though the pandemic has become a catastrophe on human life worldwide, I would like to put forward some salutary aspects it brought about in the society. First it has reminded who truly keeps society functioning: key workers- health workers, caregivers, social workers, drivers, teachers, bank officials, police officers, farmers, cleaners etc. Society often take these workers for granted, but without them we would sink into chaos. The second is the understanding that society and its system are much more fragile than we thought. Some of the best health systems also found to be incapable of controlling the pandemic. Third is that we started thinking more about sterilization protocols and infection control practices which was a negligent topic in pre covid era. Fourth is the boom in the online education & communication, covid has ignited....

With these few words I use this opportunity to thank all the office bearers of IDA Thiruvalla for entrusting me with the responsibility as Editor of this E-journal "TAPER". I also thank all the contributors and sponsors for bringing up this journal in a colourful way.

With greetings to all members

Dr. Minimol K Johny MDS

Editor, TAPER

IDA Thiruvalla

PRESIDENT'S MESSAGE

Warm Greetings to all

TOUGH TIMES DON'T LAST, BUT TOUGH TEAMS DO!

Admiring COVID 19 Pandemic, it gives me immense pleasure and honour to present to you the fourth edition of our Journal. With gratitude and admiration let me congratulate our editor Dr. Minimol K Johny for her hardwork and dedication in providing our members an opportunity to enhance their knowledge, clinical skills and introducing them to new concepts.

The strength of our Dental Association relies on the participation of all our members. Since the inception of IDA Thiruvalla, It has endeavoured as a major platform to organise and conduct various educational, social and cultural activities. Our activities of this year started by conducting classes for the district wise Oral health awareness campaign of IDA Kerala State '*Shraddha2020*'. We also conducted various school dental health programmes. World Cancer Day was observed at YMCA Thiruvalla followed by an Oral Screening camp. Motivational classes and young promising dentist award was given on this year's Dentist Day held on March 6. WDC celebrated International Women's Day at Asha Bhavan Othara on March 8th and distributed saplings to propagate its motto of this year 'Go Green'. During the lockdown period we were able to conduct seven webinars. We were able to lend a helping hand by providing dental kit to all our members

These times, being the very darkest hours of mankind, let us together as a team discover the true strength of the light within us that can never ever be dimmed. Special thanks to Dr. Seema Joseph for the cover page oil painting. I also thank our entire team for the constant efforts and support each one of you have taken to achieve all that we are today.

We the team of IDA Thiruvalla encourage all of you to extend your whole hearted participation for all our programmes in the years to come

GOD BLESS YOU ALL

Thank You

Dr. Simon George

President

IDA Thiruvalla

SECRETARY'S MESSAGE

Dear Members

Warm regards from IDA Thiruvalla branch office

We know that the world is going through one of the rarest phases since its existence. Historians might call this era as pre covid era and post covid era. The year 2020 has been an year of losses for majority of human race all over the world in one way or the other, some have lost their own lives, some have lost their dear and near ones, some have lost their jobs, economy in dire straits, medical scientists boasting of advancements in the the field of medical science seems to be jokers in front of this deadly virus, shake hands have become namasthey's, lipsticks have become an unwanted item in make up kits, fashion mouth masks have become a part of our daily wear, work from home and study from home have become the trend. Our profession is also facing the greatest obstacles of all times.

We as a branch could involve in some activities and also help our members in the best way at these times of difficulties. I hope and pray that these times will change soon and we will be back to normal way of life soon.

It's great that our editor has come up with an issue of TAPER in quick successful time. Special appreciation to the editorial board and all authors who have written articles for this Journal.

Let me thank all our members for your support in all the activities of the branch and hope that these times will also change and we can continue to join hands to help in the betterment of our members.

Thank-you

Maintain social distancing and stay safe

Dr. Thomas Jacob

Hon: Secretary

IDA HOPE (Help Offered to Professionals in Emergencies)



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Dr Saji Kurian
Hope representative
IDA Thiruvalla

An Update on SARS- CoV-2 for Dental Practitioners

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The world in general and dentistry in particular have ceased to exist as we knew it in the wake of Covid 19 (SARS - CoV-2). Here an attempt will be made to cover some of the important aspects of Covid 19 in relation to dentistry but it should be borne in mind that the disease in question and the data relating to it is fast evolving with newer evidence being unearthed and guidelines being amended accordingly.

About The Disease

Covid 19 is an infectious viral disease caused by the novel corona virus. As current evidence suggests, Covid 19 spreads primarily through interpersonal contact.

Virus Transmission

Aerosols are solid or liquid particles suspended in air; while they can be visible, most often, they are not. Aerosols can be divided into large droplets (more than 5 microns) and small droplets(less than 5 microns). Large droplets behave

ballistically and tend to be falling and the infect the recipient. This mode of transmission is known as droplet transmission.

Small Droplets stay suspended in the air for a variable amount of time due to buoyant forces, or they evaporate and change into a solid particulate “droplet nuclei” that float freely. The transmission via these small droplets is known as airborne transmission.

Lab Tests

- **rt PCR**

PCR or polymerase chain reaction is a process that repeatedly copies and amplifies the specific genetic fragments of the virus ensuring that there is enough of a sample to conduct an analysis. The rt PCR test starts with a swab taken from the nasopharynx. Corona Viruses have RNA as their genetic material; however, swabs may

yield insufficient material which may not be adequate for testing. To overcome this problem the RNA (single strand) is converted into DNA (double strand) using an enzyme. This process is known as reverse transcription. As the next step primers are used, which are small pieces of DNA designed only to bind to the selected DNA sequence of the SARS Covid 2 viral genome. The patient sample primer and probe (fluorescent dye) are left together in the PCR machine for binding to take place. A fluorescent signal marks the presence of the virus.

- **Antigen Testing**

These tests are designed to detect a specific protein that elicits the body's immune response. In case of Covid 19 it is a spike protein present on the surface of the corona virus that facilitates its entry into the human cell. For this test nasal swab is collected that is immersed in a solution that deactivates the virus. A few drops of this solution are put on a test strip which contains artificial antibodies designed to bind to corona virus proteins. If a person is infected with the corona virus the test lines

will appear on the strips within 15 mins. If swab samples does not contain enough antigen material, it results in false negative.

- **Antibody test or Serological tests**

Antibody test detect whether the person has antibodies to the virus, which are naturally produced by the bodies immune system to fight off infections. They cannot be used to diagnose covid 19 but can reveal whether a person was recently exposed to the virus. A few drops of blood are collected and placed on a cassette or cartridge that contains the covid 2 proteins. If antibodies are present in the blood, they will immediately bind to the proteins, indicating a positive result.

Few commonly used terms in relation to Covid 19.

Fomites

Fomites can be described as objects or materials which are likely to carry infection such as clothes, equipment, and furniture.

Viral Load

Viral load also known as viral burden is a numerical expression of the quantity of virus in a given volume of fluid, sputum or

blood. It is expressed as viral particles or infectious particles per ml depending on the type of assay. Estimating viral load may help in calculating the minimum numbers required for causing a viral infection and also used to monitor therapy during chronic infections.

MPPS

0.3 microns is considered as the MPPS or Most penetrating particle size. Particles above this size may move in anticipated ways and will get trapped in a filter with gaps smaller than the particle size. Particles smaller than 0.3 microns exhibit Brownian motion, which makes it, easier to filter. (Brownian motion refers to a phenomenon where particles no longer travel unimpeded through air). So this point between normal motion and Brownian motion is the hardest particle size for filters to capture. This means that high filter efficiency at 0.3 microns size will generally translate to higher filter efficiency below this size also.

Pre Procedural Mouth Rinse (PPMR)

The goal of PPMR is to reduce the number of viable oral microorganisms rather than eliminating them. This also reduces the number of organisms that may escape a patient's mouth during dental care through aerosols, splatter or direct contact.

Recommended PPMR is Povidone iodine (2% weight per volume) mouth rinse for a minimum of one minute. Chlorhexidine mouth rinses (0.2 % to 0.12 %) also may be effective

Biofilm

A Biofilm is an architectural colony of microorganisms, within a matrix of extracellular polymeric substance which they produce. It contains microbial cells adherent to one another and to a static surface.

Dental Aerosol Vs Medical Aerosol

Aerosol Generating Procedures (AGP):
Aerosol generating procedures are Medical and Dental interventions with a potential to create aerosols in addition to that the patients naturally produce during breathing, speaking, sneezing and coughing. AGPs produce both small and large droplets and each creates a different pattern and composition of aerosols. The term AGP should not be used freely and one should not presume that all AGPs have the same risk. It is inaccurate to conclude generating aerosols will cause infection. It is also inaccurate to grant equal risk between Medical and Dental AGPs.

Medical AGP: are of two types

- Induce the patient to produce aerosols (tracheal intubation)
- Mechanically created aerosol (ventilation/ suctioning/ nebulisation?)

Dental AGP: The tissues and fluids of oral cavity are teeming with viruses and bacteria. At the same time, dental aerosol transmissions have little known history of infectivity when proper protocols are followed. Dentists have routinely generated aerosols in patients infected by pathogens.

Medical aerosols are usually ballistic in nature while dental are non-ballistic in nature. Water used in handpieces may further reduce concentration of bacteria. Aerosols rotate in the oral cavity within the curtain of buccinators before reaching out in the atmosphere.

Human Saliva and Covid 19

Human saliva can host several viruses including Sars Cov 2. The transmission chances of virus through saliva, those particularly causing respiratory infections, is unavoidable in a dental office. The analysis of saliva in covid 19 cases can help to explain pathogenesis because the epithelial cells in the oral cavity demonstrate ample expression of angiotensin converting enzyme (ACE II)

that plays a critical role in allowing Sars-Cov-2 to enter the cells. Sars – CoV- 2 has atleast 3 separate routes to present in saliva (i) the virus in the lower and upper respiratory tract reaches the oral cavity along with the liquid droplets (ii) Virus in the blood may enter the mouth through the gingival crevicular fluid (iii) Major and minor infections of the salivary glands with the ensuing release of particles into the saliva.

Disinfection of clinic

Soap vs Sanitizer

Soap combined with running water is remarkably effective at destroying the surface membranes of some bacteria and viruses including the novel corona virus. The lathering of hands and scrubbing thoroughly creates friction that helps lift and wash away dirt, grease, and microbes under running water. Soap takes at least 20 seconds to disinfect our hands completely.

Applying a hand sanitizer may be easier but even ones with sufficient alcohol content (60-95%) cannot remove all types of bacteria and viruses. Lesser concentration of alcohol merely reduces the growth of germs rather than kill them and also some bacteria have begun to show a tolerance to low concentrations of ethyl alcohol.

Surface Disinfection

Cleaning should progress from the least soiled or cleanest to the most soiled dirtiest areas and from the higher to lower levels so that debris may fall on the floor and may be cleaned at the end.

Sodium hypochlorite

The recommendation of 0.1% (1000PPM) in the context of Covid 19 is a conservative concentration that will inactivate most of the pathogens that may be present in a healthcare setting. However, for blood and body fluid large spills (more than 10ml) a concentration of 0.5% (5000PPM) is recommended. Hypochlorite is rapidly inactivated in the presence of organic material regardless of the concentration used. It is important to first clean surfaces with soap and water or detergent using mechanical action such as scrubbing. High concentration of chlorine can lead to corrosion of metal and irritation of skin or mucous membrane.

To achieve the desired concentration of sodium hypochlorite the following formula may be applied

$$\begin{aligned} & \% \text{ chlorine in liquid sodium hypochlorite} \\ & \div \% \text{ of chlorine desired} - 1 \\ & = \text{total parts of water for each part} \\ & \text{of sodium hypochlorite} \end{aligned}$$

Example :

$$\begin{aligned} & 5\% \text{ chlorine in liquid sodium hypochlorite} \div \\ & 0.5 \% \text{ of chlorine desired} - 1 = \\ & 9 \text{ total parts of water for each part of sodium} \\ & \text{hypochlorite} \end{aligned}$$

UV lights

UV lights are produced by the sun and special lamps. There are 3 types of UV lights UVA, UVB and UVC of which UVC has the most energy. This energy destroys the genetic material inside viruses and bacteria. Therefore, UVC light is used for disinfection. It has been shown to destroy other corona viruses and so probably may work against the novel corona virus also. UV light can be damaging to human skin and should be used only on surfaces or objects.

UVC can be used either in sterilisation containers or for operatory disinfection when fitted as ceiling lights.

Fumigators/ Fogging machine

While fumigation involves spraying formaldehyde and potassium permanganate in liquid form, fogging uses the mixture of hydrogen peroxide and silver ion solution to control the contamination. Fogging is

preferred to fumigation as formaldehyde has been found to be carcinogenic.

HEPA Filter

HEPA stands for High efficiency particulate air filter is a designation used to describe filters that can trap 99.97% of particles that 0.3microns. Most modern HEPA filters consists of interlaced glass fibres that are twisted and turned in various directions to create a fibrous maze. It may be useful to differentiate between American and European HEPA standards as in Europe the filter only needs to capture 85% particles in comparison to the American versions 99.97% to be certified.

Barrier protection

PPE

An ideal PPE kit should contain coverall/ gown with full sleeves, head cover, shoe cover, face shield or goggles, ear plugs, masks or respirators and gloves. It is not advisable to reuse personal protective equipment. The coverall or gown should be made with non-woven fabric of at least 70 GSM.

Mask Vs Respirators

Masks should be worn with coloured surface facing outwards. They are loose

fitting, covering the mouth and nose and usually meant for one-way protection. Contrary to belief they are not protective for the wearer or rather to protect those around them. Majority of the masks do not have a safety rating.

Respirators are tight fitting designed to create a facial seal. Non valve respirators provide a two-way protection by filtering both inflow and outflow of air. They are available as disposable, half face or full face. Respirators are measured by their efficiency at filtering particles of 0.3 microns

Surgical masks have a 3-ply layer design with two sheets of non-woven fabric sandwiching a melt blown layer in the middle, which provides filtering capability. N95 respirators are 95% effective in providing barrier protection to non-oil aerosols. Surgical masks are approved by the US Food and Drug Administration and N95 respirators are tested by NIOSH (National institute for occupational Safety hazards).FFP (Filtering face piece) 1, 2 and 3 are European standards. FFP2 is comparable to N95. KN95 describes Chinese standards which may be comparable to FFP2 and N95.

Thoroughly tested N95 will have behind the head elastics which ensures a tighter

seal rather than KN95 which are held in place by ear loops.

Valved respirators makes it easier to exhale air but have limited use in medical field since only the wearer is protected.

Face Shields

Most of the recommendations for health workers stress upon the need for using a face shield along with the mask or respirator. They also offer the user additional benefit of using prescription glasses simultaneously. Fogging of face shield/goggles may be prevented by ensuring adequate seal of the mouth mask/respirator. Face shields can be cleaned using alcohol based disinfectants for reuse.

High vacuum suction

The external oral suction may remove the aerosols to prevent cross infection with the help of strong suction vacuum pressure and large flow rate. It might also make use of Ultraviolet light, HEPA filter and a brushless motor for better efficiency. Electrostatic air conditioner filters compatible with split design air conditioners can be used to complement the existing filtering screens.

Dental Unit Waterlines

At the beginning of each workday dental unit lines should be flushed with water or mild germicidal solution for atleast two minutes prior to attaching handpieces, scalers, three way syringe tips and other devices. The dental unit lines should be flushed for a minimum of 2 minutes between each patient.

Modifications for Practice

Front office protocol

The front office shall be made aware of and adequately trained to make a telephonic screening, for all appointments, about history of recent travel, fever, quarantine or being from containment zones. These details shall also be documented and stored. It may be prudent to take additional consent regarding treatment during Covid times apart from consent for examination and treatment. The temperature of all patients visiting the clinic shall be recorded and those with fever (above 100F) should be referred. Waiting area shall be prepped to facilitate social distancing norms (2metres/6 feet at least) and areas to be free of all fomite such as magazines, toys, TV remotes or similar articles.

Dental Operatory Protocols

It is expected that all routine disinfection and sterilisation protocols are practised. The following additional steps may be implemented.

Ventilation and air quality management

- Maintain air circulation with natural air through a frequent opening of windows and using an independent exhaust blower to extract the room air into the atmosphere.
- Avoid the use of a ceiling fan while performing procedure.
- Place a table fan behind the operator and let the airflow towards the patient. A strong exhaust fan to be so located to create a unidirectional flow of air away from the patient.
- The window air condition system/ split AC should be frequently serviced, and filters cleaned.
- Use of indoor portable air cleaning system equipped with HEPA filter and UV light may be used.

Bio Medical Waste Management

Biomedical waste may be managed as per Govt of India Guidelines. Coveralls

require additional space, larger bins with lids may be used for their storage until they are removed for disposal by the company.

The article looks to stress upon recent developments based on available evidence and by no means is exhaustive or conclusive. As Covid 19 is a dynamic disease, recommendations (not regulations) are likely to change as newer data emerges. A dental surgeon should constantly update his or her awareness and follow them as required.

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A Cup of Tea

Dr. Priya R.

Professor, Dept of Conservative Dentistry & Endodontics, Malabar Dental College,
Edappal Kerala.

There's a lot happening these days. Or, if you look at it from another angle, there's nothing happening these days.

When I say "these days", I mean the almost-post-lock down days. The "almost" is there because our experience over the last few weeks says it doesn't take long to switch colours across green, yellow and red. So while the centre allows some laxity, certain localities have it tight as a noose. We can travel, of course, and we can't travel, too. We can go to work, sure, and we can't go to work, too.

Now, the human brain is wired to understand plateaus, by default. So these roller coasters are not easy to manage. When the 'Yes' and 'No' and 'Maybe' are mixed up, you want to give up and scream. But then, that isn't an option.

The average dentist in Kerala is one of the hardest hit lot among all. Keeping the clinic open comes with an instruction manual the size of Burket (which, I rate, as one of the most disgustingly elaborate works of literature). And closing the clinic comes with a one-liner: "You can't survive without the green!"

Unfortunately, dentistry is yet to be translated to the virtual dimension. So, online education is happening, though neither the ones supposedly in charge, nor the ones running out of charge have a passable clue.

Earlier, it was a battle cry to just beat the devil. Then it became a steady command to hold your post and prevent the invasion. It's now more of a hoarse whisper on how to walk between the rain drops.

Through all this, there's one thing that has remained quintessential. That quiet cup of morning tea. A true-blue Malayali would even swear by it. That wistful escape out of time, puts you back on track, to deal with Now. And of course the best

accompaniment is no cookie, but a crisp newspaper. Nothing changes in those few moments, really. And yet, if you ask me, those few moments make more sense than all the rest of the hours. So, sip on!

Case report

Endodontic management of two mandibular lateral incisors with two canals using dental operating microscope: A case report

Dr. Minimol K Johny*, Dr. Benley George**

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Abstract

This case report describes the root canal treatment of two mandibular lateral incisors with 2 canals and single foramina in a patient using dental operating microscope. This case report also enlightens about the various uncommon canal configuration and their frequencies of occurrence in mandibular lateral incisors worldwide.

Key words: root canal morphology, lateral incisor, root canal treatment.

Introduction

Successful endodontic management of a tooth relies on the thorough chemo mechanical preparation of all the root canals including the lateral and accessory canals. So, a proper knowledge about the root canal morphology along with its variation is mandatory to ensure the success in root canal treatments.

It is commonly believed that mandibular incisors have single root and single root canal, which is the most common canal configuration. But various root canal morphologic studies has shown that mandibular incisors can have multiple

root canal configurations.¹⁻⁸ The incidence of second canal has been reported to be as low as 0.3%⁹ to as high as 45.3%¹⁰ in mandibular incisors. Vertucci¹ has classified root canal configuration into 8 different types (Table 1). In a root canal morphologic study on mandibular incisors by Kamtane and Ghodke² in indian subpopulation using CBCT images found that 81.37% of teeth had a single canal and 28.43% of teeth had two canals in which Type 1 Vertucci configuration was the most prevalent one, and type 4 was the least prevalent. In a similar CBCT study conducted in Chinese subpopulation it was found that the incidence of a second canal

in mandibular incisors in this study was 21.55% and among the double-canal teeth, type III occurred predominantly followed by types II and V; type IV occurred infrequently. Types VI and VII did occur but rarely. Ashwinkumar et al.¹¹ reported a three canaled mandibular lateral incisor which is classified as type-I canal pattern according to a study conducted by Gulabivala et al.¹² and type- XVIII canal pattern based on a study performed by Sert and Bayirli¹³

This case report describes the endodontic management of two mandibular lateral incisors using dental operating microscope in a patient which showed vertucci's type II canal pattern.

Case report

A forty-year-old male patient reported to the Dept of Conservative Dentistry & Endodontics with the chief complaint of pain in the lower anterior region. Patient had a history of trauma 10 years back and medical history was noncontributory. On examination both lower central incisors were missing and both mandibular lateral incisors were tender on vertical percussion. Both 32 & 42 showed abnormal response to pulp vitality tests. Pre-operative radiographic evaluation shows widening of periodontal ligament space in both lateral incisors. Both the teeth were diagnosed as

asymptomatic irreversible pulpitis with apical periodontitis and root canal treatment followed by fixed partial denture was planned.

After administering local anaesthesia (1.8 ml of 2% lignocaine containing 1:200,000 epinephrine, Lignox 2%A) rubber dam (Hygienic, Coltene) isolation was done. A conservative access opening had been done with round diamond bur no #2 (MANI Inc, Toshigi-Ken, Japan) and after locating canal, intra pulpal anaesthesia was administered. Then a working length radiograph had been taken (Fig1A). On examining the IOPA another radiolucent line was noticed parallel to the file kept in the root canal, also it was evident that apical third of both teeth were curved distally. So a multiple canal pattern was expected and access opening was redefined by extending lingually to notice another orifice of second canal in both the teeth bilaterally under dental operating microscope (dental microscope, Global Surgical Corporation, USA) (Fig1E). Working length was redetermined with apex locator ((Root ZX mini; Morita, Tokyo, Japan) and confirmed with IOPA (Fig1B) to determine the anatomic relationship of both root canal with each other in both lateral incisors. It was found that the lingual canals in both teeth was seen

joining with labial canals at apical third short of apical foramen and was having a single apical foramen.

Coronal orifice opening was performed using orifice opener rotary file (Protaper universal, Densply Maillefer). Patency of

Type I	1
Type II	2-1
Type III	1-2-1
Type IV	2
Type V	1-2
Type VI	2-1-2
Type VII	1-2-1-2
Type VIII	3

Table 1 (vertucci's classification)

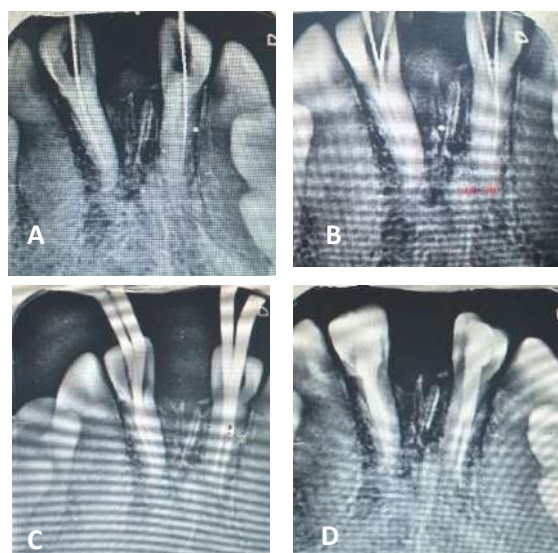


Fig 1: (A) Working Length IOPA (B) Re working IOPA
(C) Master Cone IOPA (D) Post obturation IOPA
(E) Access cavity showing 2 orifices

the canal ensured with 2% stainless-steel 10 K file (MANI Inc, Toshi-gi-Ken, Japan) and glyde path was created upto 2% 15 K file (MANI Inc, Toshi-gi-Ken, Japan) followed by cleaning and shaping with protaper gold rotary files upto F1(Densply Maillefer) using a crown-down technique in both canals of 32 &42 with copious irrigation with 3% sodium hypochlorite and normal saline solution. Final irrigation was performed with 17% EDTA solution. Calcium hydroxide paste (RC CAL, Prime Dental Products Pvt Ltd, Mumbai, India) was used as an intracanal medicament for a period of one week.

On the next appointment, the patient was asymptomatic. Calcium hydroxide paste was removed using ultrasonics. A master cone radiograph was taken to confirm the working length (Fig1C). Irrigation was done with 30 G 25 mm needles (Zodenta endo irrigation needles, 0.4mm x 25mm 30 G) using 3% sodium hypochlorite and 17% EDTA with activation of irrigant using ultrasonic U

files #15 size (MANI). The canals were then dried with absorbent points (Dentsply Maillefer, Ballaigues, Switzerland), and obturation was performed using AH Plus resin sealer (Maillefer, Dentsply, Konstanz, Germany) with F1 protaper guttapercha. The teeth were then restored with resin composite (3M ESPE).Post obturation IOPA was taken (Fig 1D).

Discussion

The main objective of root canal treatment is thorough mechanical and chemical cleansing of the entire pulp space and complete obturation with an inert filling material.¹⁴ According to the endodontic literature, mandibular incisors with 2 canals are not unusual and evidence of these unusual patterns are shown in various root canal morphological studies and they are listed out in table no 2 .From the table its very evident that most common root canal pattern found in mandibular lateral incisor is vertucci type I canal pattern followed by type III and Type II pattern. Type IV &Type V pattern appears to be rare in lower lateral incisors. All other vertucci's pattern found to be very rare in lower lateral incisors. It is very interesting to note that many morphological studies shown the presence of canal patterns which are not categorised under vertucci's classification in lower

lateral incisors and they are listed out under the heading others in table no:2.

According to a recent study conducted by Song et al., missed canal is the second most common reason for failure of endodontic treatment ¹⁵. Multiple angulated preoperative radiographs can help us identify complex root canal anatomies of the root canal system and thereby reduce the incidence of missed canals during routine endodontic therapy.¹⁶ Use of higher investigation tools such as cone beam computed tomography (CBCT) has also been suggested for better understanding of the aberrations in the root canal anatomy. Even though use of CBCT involves less radiation than conventional CT, the radiation dose is still higher than regular conventional intraoral radiographs .¹⁷ In our case report, an additional canal was found lingually and the extra canal was clearly distinguishable on examination under the surgical dental operating microscope. Use of the surgical operating microscope is indispensable in the field of endodontics. Matherne et al. ¹⁸ suggested the use of CBCT and surgical microscope to successfully diagnose various aberrations in the root canal anatomy. Sabala et al. ¹⁹ reported that in 60% of the cases, bilateral symmetry of variation is usually observed. He also stated that as the

aberration increases, it is more likely to be bilateral in occurrence.

In the present case report we had 2 canals in mandibular incisors which was merging short of apex (vertucci's type II) and the anatomy was bilaterally similar.

Many mandibular incisors have two canals, which may merge into one canal before reaching the apex. In rare cases, separate

Author	Type of study	Country	I	II	III	IV	V	VI	VII	VIII	Others
Vertucci JADA 1974	Clearing 100 nos	USA	75	5	18	2	-	-	-	-	-
Kartal JOE 1992	Clearing 100 nos (centrals & Laterals)	USA	55	16	20	4	3	-	-	-	2
Sert IEJ 2004	Clearing 200 nos	Turkey	74	54	53	19	-	-	-	-	1
Leoni JOE 2014	Micro CT 50 nos	Brazil	62	-	28	-	-	-	2	-	8
Han JOE 2014	CBCT 1294 nos	China	73	4	16	2	5	0.2	0.2	-	0.08
Kamtane Pol J Radiol 2016	CBCT 50 nos	India	65	24	9	3					

Table 2 *Morphologic Studies on Root Canal Aberrations of Mandibular Lateral Incisors Percentage Frequency distribution of various canal patterns based on vertucci classification.*

foramina may form. In a radiographic study of 364 specimens, Benjamin and Dowson reported that 41.4% of the mandibular incisors had two separate canals; of which only 1.3% had two separate foramina.²⁰

Conclusion

This report has described the root canal treatment of two mandibular lateral incisors, each with 2 separate canals in a patient. This case report emphasizes the need to conduct more root canal morphological

studies in Indian subpopulation to have a wide knowledge about aberrant root canal patterns. Also it enlightens us about the importance of CBCT and dental operating microscope in finding extra canals which is needed for successful endodontic treatment.

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ROLE OF ALTERNATE DISPUTE RESOLUTION MECHANISMS AS MEANS FOR CONFLICT RESOLUTION

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INTRODUCTION

When a dispute arises between parties, it is usually decided through litigation. When a civil suit is filed in a court of law, a formal process occurs, which is operated by Advocates and managed by the Court. The parties virtually lose all control over the result of their dispute when a court makes the decision. Litigation is a costly affair and it takes a lot of time to get a final decision of the court. Litigation harms relationships and causes emotional stress. Participation in a civil court is unpleasant and cumbersome to the litigants. Our justice delivery system suffers from the following defects namely - procedural delay in disposal of cases, complicated procedure, high cost of litigation, limited number of judges, limited number of lower courts. In order to overcome the delay and to provide effective justice, it has become imperative that Alternative Dispute Resolution (A.D.R.) mechanisms should be employed to bring an end to litigation between the

parties at an early date. ADR mechanism includes Arbitration, Conciliation, Mediation, Negotiation and Lok Adalats etc.

This article is aimed at providing an elementary knowledge about various Alternative Dispute Resolution mechanisms that are available in our country for the benefit of health care professionals. An awareness about the Alternative Dispute Resolution techniques would help health care professionals facing litigations to arrive at a speedy resolution of their conflicts in an amicable way.

ALTERNATIVE DISPUTE RESOLUTION

Alternative Dispute Resolution (ADR) refers to any method sought for resolving disputes other than by way of litigation in the courts. By means of the Alternative Dispute Resolution mechanisms, the parties to any dispute can settle the issues, with or without the help of a third party.

ADR mechanisms have an advantage of providing parties with the opportunity to reduce hostility, to resolve conflict in a peaceful manner, and achieve a greater sense of justice in each individual case. ADR includes a variety of processes through which litigants or potential litigants may resolve their disputes. Unlike the courts, which use adversarial processes, ADR focuses on effective communication and negotiation.

Advantages of ADR mechanism

ADR mechanism is preferred over traditional court-litigation because it renders speedy relief to the parties and can be used at any stage of the proceedings. It is a more time-saving process to resolve the dispute compared with traditional court litigation process. Moreover, it will reduce the burden of the courts and it can also provide better solution to the litigants as expeditiously as possible. Presence of lawyer is not necessary in this mechanism. Parties have every right to approach the regular court when they fail to arrive at a settlement. Statement of the parties cannot be used as an admission in court proceedings if the parties fail to arrive at a settlement. The procedures are flexible as they are not affected with rigors of strict rules and procedures. Technicalities of

law and procedures, rules of evidence have no place in ADR mechanism.

ARBITRATION

Arbitration is a process of resolving a dispute or a grievance outside a Court system by presenting it for decision to an impartial third party who is known as Arbitrator. It is a process of resolution of disputes which takes place in pursuant to an 'arbitration agreement' among two or more parties, through which parties agree to be bound by the decision of the arbitrator in accordance with the law mutually agreed upon. The Arbitrator gives decision after hearing both the parties. The decision of Arbitrator is known as Arbitral award. Such awards can be enforced in courts. Arbitrations takes place because parties to contracts agree that any future dispute concerning the agreement will be resolved by arbitration. In arbitration, participation of the parties to disputes is voluntary.

CONCILIATION

Conciliation is an ADR process in which a third party assists the parties to resolve their dispute by agreement. Such a third party is called 'Conciliator' or 'Conciliation Officer'. It is a compromise settlement with the assistance of a conciliator. A conciliator may do this by

expressing an opinion about the merits of the dispute to help the parties to reach a settlement.

MEDIATION

Mediation is an ADR process for resolving disputes with the aid of an independent third person, known as 'Mediator' who assists the parties in dispute to reach a negotiated settlement. Mediation is the acceptable intervention in to a dispute of a third party who has no authority to make a decision. The objective of the third party is to assist the parties in reaching an acceptable resolution of the dispute. The mediation process is voluntary and does not eliminate other dispute resolution options. It is confidential, whether or not it results in the settlement and resolution of the dispute.

Difference Between Mediation And Conciliation

Many a times, conciliation and mediation are used interchangeably and they are together referred to as Mediation. A mediator assists the parties to reach an agreement for resolving the dispute and he does not express his opinion on merits of the disputes; whereas a conciliator may express an opinion about the merits of the disputes. In both, a third party is appointed to assist the parties to reach a

settlement of their dispute. The mediator is not given any power to impose a settlement. His function is only to try to break any deadlock and encourage the parties to reach an amicable settlement. A mediator does not determine a dispute between parties.

Pre Trial Mediation

A provision is introduced in Section 89 of the Code of Civil Procedure as amended in 2002 for encouragement of pre trial alternatives for resolving the disputes. This provision provides for conciliation, mediation and pre-trial settlement methodologies. Pre-trial mediation is a settlement of disputes by the efforts of the courts before initiation of proceedings before it.

NEGOTIATION

Negotiation is an ADR process by which parties resolve their disputes. They agree upon course of action and bargain for advantage. Negotiation bargaining is a process in which both the parties cooperate and seek a solution that is mutually beneficial. If negotiation succeeds, the parties sign a settlement agreement incorporating the terms and conditions of the agreement. They can simply enforce this agreement if needed. If negotiations fail, then it is necessary to seek the

assistance of a neutral third party or parties to reach a solution.

LOK ADALATS

Lok Adalat or People's courts are established to provide for free and competent legal services to the poor and weaker sections of the society to ensure justice on the basis of equal opportunities. The main object of the creation of the Lok Adalats is to provide speedy justice to poor and needy persons at less expenses. The Legal Services Authority Act, 1987 makes provision for the establishment of Lok Adalat. Section 19 of the Legal Services Authorities Act, 1987 provides for organization of Lok Adalats. A Lok Adalat shall have jurisdiction to determine and to arrive at a compromise or settlement between the parties to a dispute in respect of any case pending before any court or any matter which is falling within the jurisdiction of any court and is not brought before it for which the Lok Adalat is organized. The Lok Adalat consists of serving or retired Judicial officers and other persons. The State legal services authority, District legal service authority, Taluk legal service authority, High court legal service committee and Supreme court legal services committee may organize such Lok Adalats at such intervals and

places for exercising such jurisdictions and for such areas as it thinks fit.

NYAYA PANCHAYATS

'Nyaya Panchayats' are village courts with civil, criminal and revenue powers as granted to them under certain laws. They have the power to decide civil and criminal disputes of petty and local nature. The concept of Nyaya Panchayat was very popular and prevalent in ancient India. Now a days, Nyaya Panchayats are established under statutory enactments in many states like Utter Pradesh, Madhya Pradesh and West Bengal. Nyaya Panchayat serves an instrument of law and order for the purpose of conciliation and arbitration within the village community. The jurisdiction and powers of the Nyaya Panchayat depends upon the respective statute under which it is constituted.

TRIBUNALS

The tribunal system was evolved in our country to provide an alternative to the regular courts. The tribunals are presided over by experts of their respective fields. The Tribunals are not only less costly in comparison to regular courts but they also resolve the disputes by taking much less time compared to the regular courts. Examples of Tribunals are - Central Administrative Tribunal, Income Tax

Appellate Tribunal, Industrial Tribunal, Railway Rates Tribunal etc.

OMBUDSMAN

Ombudsman is a third party selected by an institution to deal with complaints by employees or clients. An organisational Ombudsman works within the institution to look into the complaints, independently and impartially. For eg: Banking Ombudsman constituted by the Reserve Bank of India to deal with complaints of bank customers against Banks.

CONCLUSION

ADR mechanisms have proven to be one of the most effective mechanisms to resolve disputes relating to domestic and international commercial issues. Many disputes like consumer complaints, family disputes, business disputes, etc. can be effectively resolved by ADR. It can be used in almost every dispute, which can be filed in a court as a civil suit. Now-a-days the approach of Judges, lawyers and parties throughout the world is changing towards adoption of ADR instead of court-litigation. ADR can be used as an alternative to time consuming adversarial process of court-litigation. ADR is an alternative for those parties who are willing to communicate with each other

and make genuine attempt to resolve the dispute with the help of a neutral party.

In my next article, I shall explain about the legal aspects of medical negligence. Issues pertaining to medical negligence are of prime concern to health care professionals in their routine practice. Standard of care given, Duty to disclose, Informed consent, Confidentiality are important aspects involved in cases of medical negligence. Burden of proof is always upon medical professional to prove that he/she had taken all necessary precautions to avoid the alleged negligence that had occurred.

Case report

CERAMIC LAMINATE - A CASE REPORT

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INTRODUCTION

Porcelain is considered to be one of the most esthetic and biocompatible material available for dental restorations.

Porcelain veneers are of human nail thickness and hence minimum invasive technique is necessary for the tooth preparation.

Generally porcelain veneers or laminates are used to cover up enamel defects on the labial surface of teeth and for space closure giving a good esthetic appearance.

Chief Complaint: Patient visited Dental Clinic with the chief complaint of spacing between upper front teeth.

History: The patient noticed spacing between his front teeth since many years which caused difficulty in speech and unpleasant appearance.

Diagnosis: Generalized spacing between upper anterior teeth.

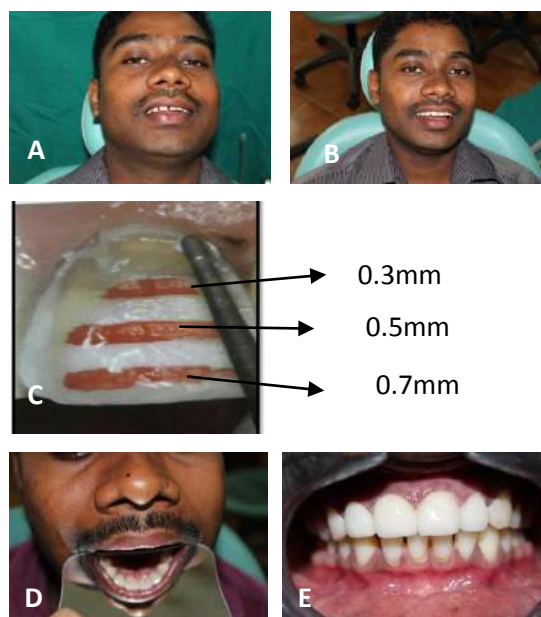
Treatment plan: Laminates on maxillary centrals and Lateral incisors.

Procedure: Upper and Lower impressions are taken using alginate impression material and study models are prepared.

The palatal aspect of the teeth is build up using light cure composite and spaces between the anteriors are closed in the study model. Silicon putty Index is then prepared.

Stage I

After tooth preparation from palatal aspect, acid etchant is applied on the grinded aspect of the anterior teeth for 15 seconds. The tooth is washed for next 30 seconds. Putty index is placed from the palatal aspect of the teeth and flowable composite is applied and cured. Hybrid composite is added over it and cured again for 20 seconds. Thus space closure is achieved between the anterior teeth.



A: Pre-op Image B: After composite build up

C: laminate preparation D: Laminate incisal view
E: Post- op labial view

Impression is taken again using putty impression material and it is set aside. This impression is used for preparing temporary crown for anterior teeth after the teeth preparation for the Laminates.

PREPARATION OF TEETH FOR LAMINATE

Local anesthesia is administered before the teeth preparation. Preparation of the teeth for Laminates is called as “Wrap-around preparation”. The gingival retraction cord is placed on the centrals and lateral incisors. ^[1]Then final impression is taken with putty and light body. The putty impression which was kept aside after the spaces been closed is injected with composite and inserted back in to the patient’s mouth.

Temporary crown is prepared and bonded with marginal bond and composite.

Shade map is then prepared for proper communication to the lab.

Stage 2

First step is the try in of Laminate with KY Jelly. Hydrofluoric acid is applied on the inner surface of Laminate. Then it is washed and dried. Mono bond is applied on the inner surface of Laminate and kept under amber colored cover. Acid etchant is applied for 15 seconds on to the enamel surface of the teeth and washed after 30 seconds with water. Primer is applied for 20 seconds followed by bonding agent and light cured for 20 seconds. Catalyst and base paste of Vario link is mixed and loaded on to the Laminates. Laminate is placed on the tooth surface and excess cement is removed with zero number brush. It is then light cured for 40 seconds. Remaining excess is removed with 12mm blade. Digital photograph shows good aesthetic appearance and spaces closed.

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Review Article

EATING DISORDERS AND THEIR ORAL IMPLICATIONS

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ABSTRACT

Anorexia nervosa and bulimia nervosa are two of the most commonly encountered eating disorders and they present with various oral manifestations. The dentist is often the first to encounter and diagnose these disorders and hence a thorough knowledge and understanding of the oral implications is essential.

KEYWORDS: Anorexia Nervosa, Bulimia Nervosa, Oral Manifestations

INTRODUCTION

Anorexia nervosa and bulimia nervosa are two of the most commonly encountered eating disorders.¹ They affect approximately 1-10% of the adolescent population and college age women.^{1,2} The term anorexia nervosa is derived from the Greek word “orexis” for appetite and literally means “a nervous loss of appetite.”³

Anorexia nervosa is defined by the American Psychiatric Association’s Diagnostic and Statistical Manual on Mental Disorders, 4th edition (DSM-IV)

as a refusal to maintain body weight at or above 85% of the normal weight for a particular age and height, accompanied by an intense fear of gaining weight, an undue emphasis on body shape or weight and amenorrhea for 3 consecutive months.⁴

Anorexia nervosa is divided into 2 categories:

1. Restricting type: Patients will restrict their food intake and engage in excessive exercise.

2. Purging type: Patients will restrict their food intake and engage in purging after eating.⁴

The term bulimia originates from two Greek words, 'bous' referring to ox and 'limos' which means hunger. Bulimia literally means possessing the ability to eat like an ox or have the appetite of an ox.⁵

Bulimia nervosa is defined in DSM-IV as episodes of binge eating that recur at least twice weekly for 3 months or longer. Bulimia is also subdivided into 2 categories:

1. Purging Bulimia: Patients engage in inappropriate behaviour to compensate or avoid weight gain due to over eating like misuse of diuretics, laxatives, enemas or purging.
2. Non Purging Bulimia: Patients engage in compensatory behaviours such as intermittent fasting and excessive exercise in the absence of purging and without misuse of diuretics, laxatives or enemas.⁴

Due to the extreme secrecy associated with binge eating and purging, bulimia nervosa is difficult to diagnose. The weight of these individuals is often normal.^{6,7}

ETIOLOGY

The etiology is multifactorial and some of the contributing factors include cultural and social pressures to be thin. Other factors include mood disorders, physical and sexual abuse, family history of obesity or eating disorders, lowered self-esteem, drug abuse, dysfunctional family background and early onset of menarche.^{4,7}

PHYSICAL AND SYSTEMIC MANIFESTATIONS

Patients may present with psychosocial problems such as anxiety, social withdrawal, obsession regarding body weight and physical appearance and sleep disturbances etc.

Patients with anorexia nervosa are underweight. However those with bulimia nervosa may have a normal weight or be overweight and are rarely underweight. Clinical manifestations are usually a result of starvation or purging. These may include bradycardia, dizziness, headaches, syncope, palpitations, seizures, cramps, gastro-esophageal reflux disease, hematemesis, orthostatic hypotension, delayed gastric emptying, hypothermia, sore throat, loss of muscle tissue and subcutaneous fat, dry skin, amenorrhoea, lanugo, knuckle calluses due to the usage of fingers to induce vomiting (referred to

as Russell's sign), osteopenia or osteoporosis and rectal prolapse (due to misuse of laxatives).⁸

ORAL MANIFESTATIONS

Dentition:

Erosions of the enamel referred to as perimylolysis may be present on the palatal aspect of the maxillary anterior teeth as a result of exposure to gastric acids secondary to chronic vomiting. Rarely, the mandibular teeth may also be affected. This erosion appears smooth and glassy initially. The posterior teeth may be involved at times resulting in changes in the occlusal anatomy leading to altered occlusion. Dentinal hypersensitivity is often experienced by these patients.^{1,4,9,10}

The prevalence of dental caries among patients with eating disorders is unclear. Studies have shown conflicting results.^{11,12} However, exposure to high amounts of gastric acid in the oral cavity reduces the oral pH and may predispose to the development of dental caries. Other factors contributing to the formation of dental caries include poor oral hygiene, a cariogenic diet and xerostomia.¹³

Mucosal Changes:

Although uncommon, mucosal changes may occur as a result of contact with gastric acids and due to forceful vomiting.¹

Soft tissue injuries on the soft palate may be observed due to the usage of objects to induce vomiting. Angular cheilitis and erythema of the mucosa especially on the posterior palate may also occur in patients engaging in purging.^{4,10} Other manifestations include dysguesia, burning sensation and the presence of oral opportunistic infections secondary to nutritional deficiencies and immunological impairment.¹⁰

Salivary Glands:

Sialadenosis presenting as enlargement of the parotid gland, rarely the submandibular and sublingual glands or minor salivary glands may occur due to vomiting, bingeing or starvation.^{1,4} The salivary gland enlargement is initially intermittent but gradually progresses to become persistent. It is soft in consistency and usually painless.⁴ Sialadenosis occurs as a result of peripheral autonomic neuropathy which leads to acinar enlargement as well as functional impairment. The excessive use of laxatives and diuretics, chronic vomiting and the usage of psychotropic medications in the management of eating disorders may all contribute to xerostomia. Necrotizing sialometaplasia has been reported in patients with bulimia.¹¹

Effects on the Periodontium:

Patients with eating disorders often have poor oral hygiene which may contribute to the development of gingivitis and periodontitis. Patients with associated depression are also less likely to maintain adequate oral hygiene. Nutritional deficiencies especially Vitamin C deficiency also affects the marginal periodontium and results in gingival swelling, bleeding, mobility of teeth and ulcerations.¹⁰

MANAGEMENT

Management of eating disorders involves a multidisciplinary approach. This includes a team of dentists, psychiatrists, internists, dietitians, nurses and clinical social workers and is beyond the scope of this article.¹

DENTAL MANAGEMENT

When dentists encounter a patient with a possible eating disorder based on clinical signs and symptoms, a gentle history taking with emphasis on eating habits and weight maintenance is advised in a non-confrontational and non-threatening manner. Appropriate referrals should be made whenever eating disorders are suspected.⁴

General instructions like maintaining oral hygiene, avoiding a cariogenic diet,

avoiding acidic drinks and foods like citrus fruits may be advised. Topical fluoride applications are also recommended.¹¹

Tooth desensitizing agents may be prescribed. Procedures like composite veneers, porcelain veneers, full mouth and occlusal rehabilitation may be carried out to restore aesthetics and function.^{1,11} However definitive dental treatment should be deferred until adequate control of the eating disorder has been achieved. Regular follow-up and recall of these patients is advisable.¹¹

CONCLUSION

It is important for dentists to be aware of the oral implications of eating disorders. A dentist should be able to recognize the signs and symptoms and refer the patient in an appropriate and effective manner so that the patient receives the necessary care and treatment.¹

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Case Report

ANATOMIC RECONSTRUCTION OF A TRAUMATIC ANTERIOR WITH FLARED CANAL- a Case Report

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“Great things are not done by impulse but by a series of small things brought together”

Abstract

The fiber posts are preferably used to restore teeth with compromised crown structure due to its esthetic appearance, flexibility, lack of cumbersome laboratory procedures that are required for cast posts and similar mechanical properties when compared to that of dentin. One among the modifications of the fiber post was the “Anatomic post”, which provides a three-dimensional fit to the flared canals, without hampering esthetics and mechanical properties of the dental structure. Being a befitting alternative to conventional custom-made cast posts, the anatomic posts also enhance the retention in traumatised anterior tooth with compromised tooth structure. This case report demonstrates the fabrication of the anatomic posts by using composite resins, in order to reinforce the compromised tooth structure in a traumatised anterior with flared canal.

Keywords: fiber post, anatomic post, traumatised anterior, esthetics, flared canal.

INTRODUCTION

Endodontically treated teeth are subjected to extensive tooth structure loss which

amplifies the loss of fracture resistance of the tooth caused by trauma. Rehabilitation of such teeth is of prime concern in the modern era of esthetic dentistry. Earlier, the

functional rehabilitation was achieved with the most adaptable custom-made cast posts. However, the mismatch between the physical and mechanical properties of custom-made cast posts with dentin, its unesthetic metallic display, tedious laboratory procedures, increased number of visits for the patient, lack of flexibility and wedging forces, emphasized the need for some other convenient alternative.

This paved way to the introduction of prefabricated fiber posts, which had an embracing debut at the beginning of 1990s. Since then, the tremendous proliferation of the fiber post systems as a consequence of the evolving research work, have modified their composition and properties to an alarming extend. But, their imprecise adaptation within the root canal anatomy obliged the operator to employ excessive amounts of resin cements to substitute the lost dentin. This spotlighted the emerging need for an alternative that could simulate the radicular dentin and uphold the root canal anatomy, by augmenting the adaptation of the post system to radicular dentin without compromising esthetics, strength and retention. The anatomic posts formed by relining the fiber posts with composite, maintain the mechanical properties almost similar to that of dentin

and preserve the fracture resistance by eliminating the redundant tooth structure loss. The fiber post, the composite material moulding the fiber post to anatomically replicate the root canal anatomy and the resin cement are expected to uphold the monoblock concept.

Clavijo et al and Silva et al demonstrated that the anatomical posts revealed similar fracture resistance to that of the metallic posts and had superior performance when compared to the pre-fabricated fiber posts in flared root canals.^{1,2} Macedo et al showed that the fiber post relining resulted in higher bond strength within the flared root canals when compared to the prefabricated posts without relining.³ The present case report highlights the clinical steps in the fabrication of an anatomic post and core for the successful restoration of a traumatized anterior tooth with flared canal.

CASE REPORT

A 11 year old male patient visited the department of Conservative dentistry and endodontics, with the chief complaint of broken upper front teeth 2 weeks back(Figure 1A). He had a history of fall 2 weeks back and had immediately undergone a composite restoration of upper right front tooth from a nearby dental clinic. On clinical examination, the upper left front tooth with

Ellis class III fracture had a composite restoration, was tender on vertical percussion and was not responding to cold test and electric pulp tests. On radiographic

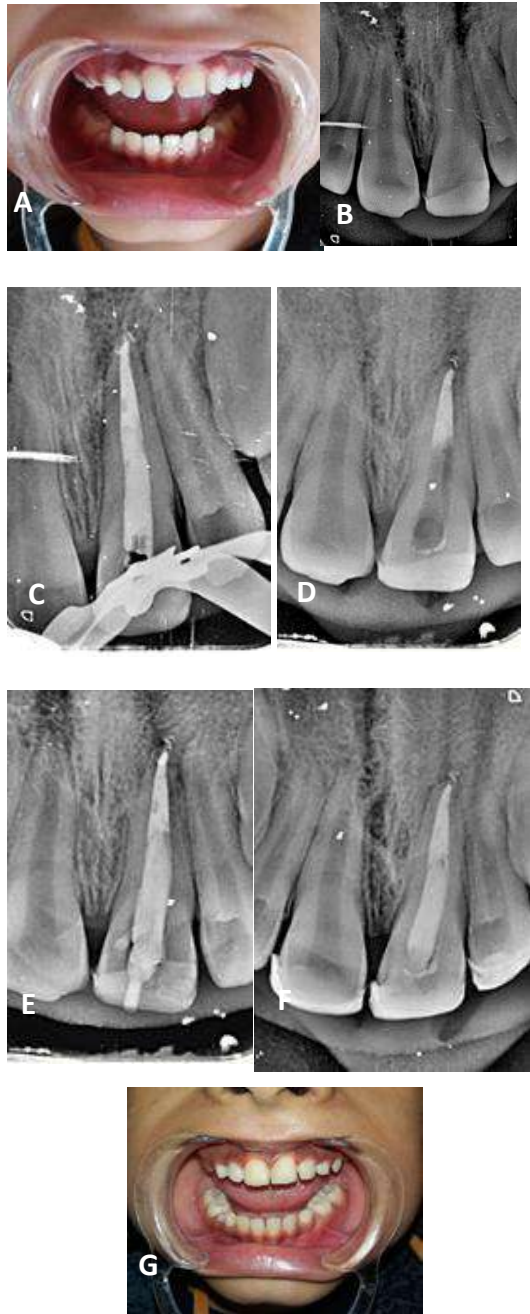


Fig 1 A:Pre-op, B:Pre-op IOPA C:Obturation IOPA,D:Postspace preparationE:Try-in of anatomical Post,F: anatomical post luted, G: Post op

examination of 21, there was radiopacity involving enamel, dentin and pulp suggestive of composite restoration and a wide radiolucent line from pulp chamber till root apex. It also had slight widening of periodontal ligament around the apical third region of the root apex. The upper left front tooth(21) with the composite restoration was diagnosed as pulp necrosis with symptomatic apical periodontitis, requiring endodontic management followed by prosthetic rehabilitation. The fractured upper right front tooth(11) was vital with normal healthy pulp and needed a class IV composite restoration. Since 21 with a wide and flared canal with closed apex needed structural reinforcement, the anatomic post was suggested to facilitate enhanced esthetics and function.

After receiving consent from the patient, the tooth was anaesthetised under rubber dam isolation. After root canal treatment of 21(Figure 1 C), the guttapercha was removed to prepare post space till peeso reamer of no.4(Mani)(Figure 1 D). No. 4 fiber post was selected and was conditioned with 37% phosphoric acid gel for 15sec, followed by rinsing and drying. The two-step etch-and-rinse adhesive system (Tetric N-Bond [Ivoclar-Vivadent]) was applied and light-cured(Blue phase; Ivoclar vivadent) for

10 seconds. Then, the fiber post was covered with a nanohybrid composite resin (Tetric N-Ceram) and was inserted into the canal, previously lubricated with a hydrosoluble gel in order to replicate the canal anatomy.(Figure 1 E) The root canal dentin of 21 was conditioned using 37% phosphoric acid gel for 15sec, rinsed and dried using absorbent paper points(dentsply), and the anatomic post was luted using the dual cure self-adhesive resin cement(SARC)(RelyX U200) and light cured for 20 sec.(Figure 1 F) The remaining crown build up was done using composite resin in increments. Later, class IV composite restoration was done for 11.(Figure 1 G)

DISCUSSION

Anatomic reconstruction of the post space with a pertinent material that exhibits similar properties to that of radicular dentin was an emerging requisite in the modern era of esthetic dentistry. The fiber reinforced composite posts are compatible with adhesive resins, luting resin cement and composite resin and therefore they form a mechanically homogenous structural complex which was referred to as the 'Monoblock Concept'.⁴ The use of fiber posts in oval or flat canals may incorporate

surplus amounts of resin cement which may inturn weaken the residual dentin or cause debonding of fiber posts. Wide/flared root canals may be a result of the carious involvement of the pulp chamber, internal resorption, excessive preparation of the root canal or due to incomplete physiologic root development. In the flared canals, reinforcement of remaining radicular dentin could be accomplished with an another innovation of anatomic posts, which demonstrated enhanced retention and fracture resistance when compared to the pre-fabricated fiber posts^{2,3}.

Following the introduction of fiber posts, Lui et al suggested the restoration of flared canals with composite resin to reduce the resin cement incorporation and enhance the post adaptation to the radicular dentin. He introduced the concept of 'Intra-radicular rehabilitation of flared canals' using composite resin along with light transmitting plastic posts⁵. The disadvantage with this technique was that adequate curing of the composite resin within the deeper regions of the post space remained questionable. The advantages of this technique include intimate adaptation to the canal shape enhancing its retention, customization of the post and core in a single visit, minimal

thickness of the resin luting cement, decreased polymerization shrinkage, reduced chances of debonding and better chemical union with the resin cement. Here, the composite resin relining the fiber post, can be secondarily cured (ie- both inside and outside the canal), prior to the final cementation of the fiber post.

Anatomic posts are reported to flex less under oblique masticatory loading when compared to other thinner posts by transferring the deformation forces along the long axis of the root. Also, the anatomic posts maintained the stress inside the post body and directed less stress laterally to the remaining walls of radicular dentin.⁶ Clavijo et al proposed another alternative pertaining to the use of accessory posts to accommodate the residual space but was not as efficient as the anatomic post since the likelihood of incorporation of large lacunae or voids into the resin cement was high during luting which in turn compromised its adhesion and mechanical performance.^{1,7} Anatomic posts exerts greater hydraulic pressure on the cement against the dentin wall, enabling better adaptation and reduced blister formation within the cement.

Thus, the anatomic posts turns out to be a boon for the flared canals since it

reduces the flaw initiating sites and facilitates deeper resin penetration into the dentinal tubules.^{8,9} Anatomic post construction involves both direct and indirect techniques. The direct anatomical posts preferred in this case report possess fewer fabrication steps and appointments unlike the indirect anatomic posts. The indirect anatomic posts require additional laboratory steps, is time consuming and expensive.¹ Therefore, this case report reveals the pertinent use of the direct anatomical post as a sublime alternative to the custom made cast posts for enhancing esthetics and biomechanical behavior of the flared root canal anatomy in a traumatized incisor.

CONCLUSION

The post endodontic management of traumatised anteriors with flared canals using direct anatomical posts enhances the mechanical, functional and esthetic desirabilities of the mutilated teeth expeditiously. Therefore, anatomic posts should be suggested as a sublime alternative to cast posts, in the percipient minds of an operator while dealing with challengingly flared root canals requiring reinforcement of tooth structure.

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Review Article

Antibiotics in Periodontal Therapy-Risks versus Benefits

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Abstract

Systemic and local antimicrobials have been used as adjuncts to periodontal therapy. Most of the antibiotic prescriptions in periodontal therapy are empirically based and are not backed by microbiologic analysis of periodontal pathogens. Disruption of the plaque biofilm is important as bacteria may be highly resistant to antibiotics in their 'biofilm' way of life. Scaling and root planning with adjunctive antibiotics have significant periodontal benefits especially in deep pockets and in cases of aggressive periodontitis. However, the periodontal benefits of adjunctive systemic antibiotics should be weighed against the side and adverse effects of antibiotics, their potential to induce persistent changes in the gut microbiota and the development of bacterial resistance.

Introduction

Periodontitis is an immune inflammatory response to microorganisms present in the plaque biofilm, progressively leading to pocket formation, clinical attachment loss and ultimately tooth loss. Periodontal pocket therapy encompasses nonsurgical, surgical and maintenance phases. Mechanical debridement of plaque biofilm and calculus from the affected root surfaces is the corner stone of periodontal therapy. The success of therapy is mainly measured in terms of a comparison of the pre and post treatment values of probing

pocket depth (PPD), clinical attachment level (CAL) and the number of sites which bleed on probing (BOP). Deep periodontal pockets in inaccessible areas, root surface irregularities and furcation involvements present major challenges to mechanical debridement. The use of adjunctive antibiotics into standard periodontal therapy began in the 1970's with the understanding that certain bacteria were frequently associated with the disease process. Anatomic factors which limit access for mechanical therapy coupled with the infectious nature of periodontitis and the presence of tissue invasive bacteria

in periodontal lesions provide the rationale for the adjunctive use of systemic or local antimicrobial therapy in periodontics. Bacteria existing in the subgingival biofilm are highly impervious to any antimicrobial agent unless the biofilm is thoroughly disrupted.

A wide range of systemic antibiotics, including amoxicillin (with or without clavulanic acid), metronidazole, a combination of amoxicillin and metronidazole, azithromycin, clindamycin, doxycycline, spiramycin and tetracycline, have been tested in clinical studies. The effects of adjunctive systemic antimicrobial therapy in chronic and aggressive periodontitis have been evaluated in a number of systematic reviews and meta-analyses.¹⁻¹⁰ Most of the authors report statistically significant and clinically relevant benefits of adjunctive systemic antibiotics in periodontal therapy. Benefits of adjunctive systemic antibiotics were reported to be more in deep periodontal pockets.^{11,12} (PPD \geq 7 mm) In recent years, the antibiotic therapy most widely documented and found to be most effective in clinical reports has been the metronidazole and amoxicillin combination and azithromycin.^{13,14} Evidence indicates that a combination of amoxycillin and metronidazole produces significant

benefits when used as adjuncts in nonsurgical periodontal therapy, both in aggressive and in chronic periodontitis.^{13,14} Systemic antimicrobials when used should be part of phase 1 or nonsurgical periodontal therapy. Evidence suggests that antibiotic intake should start on the day of debridement and be completed within a short period of time.¹⁵ The additional benefit of adjunctive antibiotics, is significantly more in aggressive periodontitis cases with deep pockets.⁸ Evidence does not justify the adjunctive use of systemic antibiotics for moderately deep pockets. (4–6 mm) except in very rare cases of young patients with moderate disease, who are infected with the JP2 genotype of *Aggregatibacter actinomycetemcomitans*. Adjunctive systemic antibiotics also produce a small but significant effect on further attachment loss.¹⁵ Evidence for an additional benefit of adjunctive antibiotic therapy in smokers with chronic periodontitis is insufficient and inconclusive.¹⁵ Also, a recent systematic review indicates minimal additional benefit of adjunctive systemic antibiotics in the diabetic patient with chronic periodontitis.¹⁶

Systematic reviews and meta-analysis on the subgingival application of an antimicrobial adjunct during non-surgical periodontal therapy, report an additional

clinical benefit in reductions of pocket probing depth in pockets >5 mm.¹⁷The most useful agents in this regard were tetracycline fibers, followed by doxycycline and minocycline. Scientific evidence supports the adjunctive use of local antimicrobials delivered into periodontal pockets using vehicles capable of sustained release of the antimicrobial at the target site. In the maintenance phase of periodontal therapy, topically administered slow-release doxycycline gel may provide short-term benefits in controlling inflammation and deep pockets in treated periodontitis patients.¹⁸

Side and adverse effects of antibiotics

The discovery of antibiotics revolutionised medicine, however they should be prescribed with caution. In periodontal therapy, the antibiotic selected, the dosage, the duration of administration and the evaluation of clinical response are often empirically based. The simultaneous intake of multiple antibiotics at a time can increase susceptibility to yeast infections. In the context of our current understanding of periodontal disease etiology in the polymicrobial synergy and dysbiosis model, overgrowth of microbes once thought of as commensals may induce further dysbiosis and disruption of host homeostasis.

The most common adverse effects reported in studies on the use of adjunctive systemic antibiotics in patients with periodontitis are nausea, vomiting, gastrointestinal discomfort, metallic taste in the mouth and head ache. Other side effects reported were musculoskeletal and respiratory disorders^{19,20} dry mouth, erythema, oral ulceration, dizziness, staining of tongue or teeth,^{21,22} irritability,²³ a rash on the face or neck and nausea after alcohol intake.²⁴No significant adverse effects were reported for locally applied adjunctive antibiotics. However, a recent systematic review has reported cases of gingival redness, pain on the first day of local administration, gingival tingling, fever, headache, diarrhoea, periodontal abscesses, root sensitivity, taste disturbances and stomatitis.¹⁷

Repeated exposure to broad-spectrum antibiotics dramatically alters the composition of human gut microbiome.^{25,26}Culture-independent studies show that these changes may persistent for years.²⁶There is growing evidence that chronic diseases such as asthma and allergic diseases,²⁷ autoimmune diseases,²⁸ type 1²⁹ and type 2 diabetes,^{30,31} obesity,³² metabolic syndrome,³³ chronic gut disorders,³⁴ atherosclerosis,³⁵ under nutrition,³⁶ celiac disease³⁷ and chronic lung infections^{38,39}

may be linked to dysbiosis of the intestinal microbiota. Further, many investigators have proposed that dysbiosis in the gut microflora could even impact our state of mind.⁴⁰

The indiscriminate use of antimicrobials has led to the development of bacterial resistance⁴¹ which is a global health concern. Antibiotic resistance is of great concern to the dental profession.⁴² To date, most periodontal antibiotic treatment regimens appear to have been prescribed without guidance from a microbiologic analysis of the subgingival microbiota.⁴³ Patients with periodontitis frequently yield multiple species of periodontal pathogens that may vary in their degree of resistance to antibiotics.⁴⁴ A recent study determined the occurrence of in vitro antibiotic resistance among selected subgingival periodontal pathogens in patients with chronic periodontitis. 74.2% of the patients with chronic periodontitis revealed subgingival periodontal pathogens resistant to at least one of the test antibiotics and 15% of patients harboured subgingival periodontal pathogens resistant to both amoxicillin and metronidazole.⁴⁵ In another study, subgingival multiple drug resistant *enterococci* occurred in 1% of early-onset periodontitis patients and in approximately 5% of adult periodontitis patients.⁴⁶

Alarming, the oral microbiota also seems to be an important reservoir for transferable antimicrobial resistance⁴⁷ Antibiotic resistance in the oral biofilm as a result of horizontal gene transfer was reported in vivo, when *Streptococcus cristaceus* acquired a transposon that conferred doxycycline resistance from a strain of *Streptococcus oralis*. Both strains were isolated from the subgingival biofilm of patients on doxycycline therapy as part of their periodontal treatment.⁴⁸ Recently, a plasmidome within *E. faecalis*, isolated from patients with marginal periodontitis was characterized, and the authors concluded that the majority of *E. faecalis* strains in marginal periodontitis lesions are likely to be a reservoir for diverse mobile genetic elements and associated antimicrobial resistance determinants.⁴⁹ Geographical differences were also found in the susceptibility profiles of *P. gingivalis* and *A. actinomycetemcomitans*.⁵⁰ There is a clearly higher level of periodontal pathogen antibiotic resistance in countries where access to antibiotics is less stringently controlled than in countries where antibiotic usage is restricted and infrequent.^{51,52}

Conclusion

With due consideration to the side and adverse effects of antibiotics, use of systemic antimicrobials in periodontitis should be restricted to patients with aggressive, severe and progressing forms of periodontitis. The clinician's decision to prescribe adjunctive antibiotics in periodontal therapy should be based on the results of weighing both benefits and risks for each patient. (Figure 1¹⁵) To provide a patient with an appropriate antibiotic therapy, it may be critical to know the susceptibility profiles of clinically relevant oral pathogens

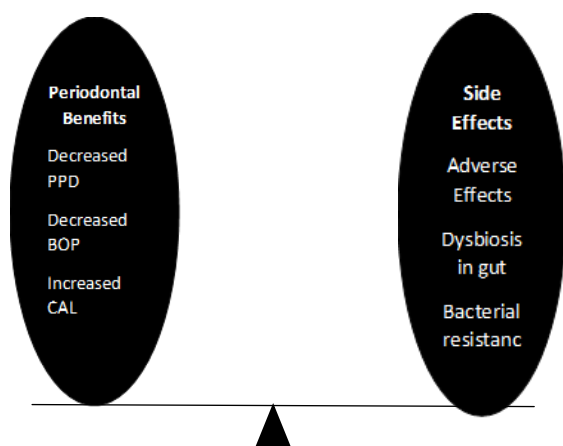


Figure 1: Adjunctive Antibiotics in Periodontal Therapy-Risks versus Benefits. PPD – Probing Pocket Depth, BOP – Bleeding on Probing, CAL – Clinical Attachment Level Adapted from Jepsen 2016

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Case-Report

Lingual Frenectomy - A Diode Laser Approach

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Abstract

Ankyloglossia or tongue tie is an abnormal congenital condition characterized by short lingual frenum restricting tongue movement which causes feeding difficulty and speech problems. Such condition can be treated by frenectomy using scalpel, laser, and electrocautery. The present case report ankyloglossia in a 30 year-old male patient treated with diode laser and followed up without any complications.

Keywords: Ankyloglossia, Diode laser, Frenectomy, Lingual frenum

Introduction

Lingual frenum is a mucosal fold that attaches tongue to the floor of the mouth. When it is short and fibrotic, it results in ankyloglossia or tongue tie [1]. According to Kotlow's classification, ankyloglossia is classified as follows [2]

- Class I: Mild ankyloglossia: 12–16 mm
- Class II: Moderate ankyloglossia: 8–11 mm
- Class III: Severe ankyloglossia: 3–7 mm
- Class IV: Complete ankyloglossia: <3 mm.

Ankyloglossia affects day-to-day activities such as speech, feeding, and oral hygiene. Surgical procedures such as frenotomy and frenectomy have been advocated for treating ankyloglossia using scalpel, electrocautery, and laser. Laser frenectomy has several advantages over other methods. Here, is a case report of ankyloglossia treated with frenectomy using diode laser.

Case -Report

An 30 year-old male patient reported to our Department of Periodontology and Oral Implantology with the chief complaint of difficulty in pronouncing certain words since childhood. Medical history and family

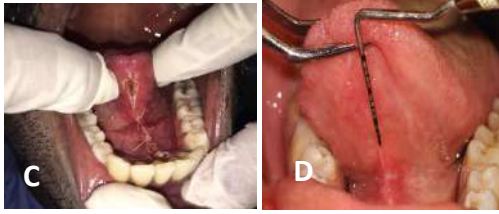
history were noncontributory. On extraoral examination, there were no significant findings noted. On intraoral examination, gingiva was slightly inflamed, edematous; loss of scalloping was observed with generalized bleeding on probing. Furthermore, stain and calculus were present in all the teeth. The patient had Kotlow's Class II ankyloglossia with tongue protrusion of 12 mm. Following an initial examination and treatment planning discussion, the patient underwent nonsurgical therapy including scaling and root planing with oral hygiene instruction followed by re-evaluation. Written informed consent was taken from the patient and a treatment plan of frenectomy with Diode laser was made. A complete hemogram depicted values within normal limits

The patient was asked to do a presurgical mouth rinse using 2 ml of 0.2% chlorhexidine solution, and 5% povidone-iodine solution (Betadine) was used to perform extraoral antisepsis. Topical anesthetic was applied to the underside of the tongue and local anesthetic infiltration using 2% lignocaine with adrenaline 1:200,000 was administered into the frenum area. Safety measures were taken for operator, patient, and assistant by wearing

the recommended laser protective eyewear. High-speed suction and clinical masks were used to prevent infection from the laser plume. Diode laser emitting 940 nm was used for frenectomy where preset value was adjusted: power of 2.00 W, pulsed contact mode, continuous pulse duration, and pulse interval of 1.00 ms. After the area was anesthetized, the incision was carried out using bendable laser tip with diameter of 300 μ m. The intervening lingual frenum was released from its apex to the base in a brushing stroke. After excision, the surgical site was wiped off with cotton pellet soaked in normal saline. The entire procedure was painless with no bleeding and lesser intraoperative time.

Postsurgical instructions were given with prescription of analgesic (Mefal forte, if needed) and warm saline rinse (3–4 times/day for 2 weeks). To minimize traumatic injury to the wound, mechanical tooth cleaning was restricted to the surgical





A: Pre-Op View B: Intraoperative view showing initiation of laser tip for the incision C: Immediate post- op view D: after 5 months

site and advised to use chlorhexidine mouth wash for 1st week. Patient was also advised some exercises: (a) to stretch the tongue upward and downward, (b) to open the mouth widely and touch the front teeth with the tongue, and (c) to shut the mouth and move the tongue into left and right cheek for 3–5 min, once or twice daily for 3 or 4 weeks postoperatively. The postoperative follow-up at 2 weeks showed improved tongue protrusion and phonetics of the patient. The patient had less postoperative pain and discomfort

Discussion

Ankyloglossia is a rare congenital anomaly which occurs due to the failure in cellular degeneration leading to much longer anchorage between tongue and floor of the mouth. Most often, ankyloglossia is seen as an isolated finding in an otherwise normal child. Segal et al[3] considered the effectiveness of frenectomy in treating ankyloglossia. In the present case report,

laser was opted for frenectomy as it was considered safe and minimally invasive procedure. Reddy et al[4] in their case series indicated that laser provides better patient perception than scalpel technique for lingual frenectomy. Iyer and Sudarsa [5] and Bade[6] also highlighted the advantages of lasers for lingual frenectomy. Histologically, laser-created wounds heal more quickly and produce less scar tissue than conventional scalpel surgery[7] although contrary evidence also exists.[8,9] The hemostatic effect of laser overall and as seen in the present case can be due to sealing of the capillaries by protein denaturation and stimulation of clotting factor VIII production which results in improved hemostasis and visualization of surgical site which can be left without sutures.[10] In addition, sterilization of wound by laser reduces the need for postoperative care and antibiotics[11].

The patient was advised to perform postoperative exercise intended to develop new muscle movements to avoid reunion and encouraging free movement of tongue. Thus, in the postoperative follow-up, improved tongue protrusion and phonetics was appreciated with better patient

perception, supported by Kishore et al. [12] and Prabhu et al[13].

Laser frenectomy is a promising technique in treating ankyloglossia. Although laser has many advantages, it requires some precautions during and after irradiation such as using protective eyewear, high-speed evacuation, and a properly trained operator as an important part of laser safety.

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Full Mouth Rehabilitation Under General Anaesthesia in Pediatric Dentistry

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Introduction

Dental caries is considered as the most common chronic health problem in childhood. Approximately 60% of 5 year old children have caries. Caries can rapidly destroy the primary dentition of toddlers and infants, and if left untreated, can lead to pain, acute infection, nutritional insufficiencies along with learning and speech problems. The pain resulting from decay can cause difficulty in eating and sleeping, which can lead to a decrease in the concentration of the child and lack of school achievement. All these can affect the family's quality of life. Children of three years of age or lesser are cognitively categorised as 'lacking cooperative ability'. Hence there arises a need for pharmacological management of these children to provide quality restorative care.

This paper strives to provide a overall view of full mouth rehabilitation under general anaesthesia in pediatric dentistry

and specifically addresses cues to identify need for treatment under GA and the myths regarding its safety.

Indications

Patients for whom general anaesthesia has been the choice of management technique include

- Patients 'lacking cooperative ability' due to age or with certain physical, mental or medically compromising disability.
- Patients with dental restorative or surgical needs for whom local anaesthesia is ineffective – acute infections, allergy, anatomic variations
- The extremely uncooperative, fearful, anxious, physically resistant or

uncommunicative child or adolescent for whom there is no expectation that behaviour will improve

- Patients with extensive orofacial and dental trauma
- Patients requiring dental care for whom the use of general anaesthesia may protect the developing psyche and/or reduce medical risks

Irrespective of the above multiple indications, the majority of the patients requiring treatment under GA fall under the 2-5 year old category who need full mouth rehabilitation due to early childhood caries. When in doubt about cooperative ability of the child one or two attempts should be made using conventional behaviour management technique before treatment under GA is considered.

Once a decision is made to treat a child under General anaesthesia, the following is the sequence of events which follow

Consent for GA

The patient's parents are clearly explained about the need, procedure, cost, risks and benefits of treatment under GA. It is prudent to make the parent clearly

understand the above and consent for treatment. Due importance and time should be given to make the parents understand about the procedure and also address all their queries.

Initial Assessment

The initial screening of patients for general anaesthesia should be performed as for any other anaesthetic. The airway is to be examined and a thorough medical history is to be recorded. The dentist also should make a tentative treatment plan including therapeutic and preventive dental procedures that the patient would require.

Pre Anaesthetic Consultation

Treatment under GA is performed in a hospital care setting in most scenarios in India. While referring the patient for anaesthetic consent for the procedure the dentist shall mention the need for the procedure. Investigations includes CBC and differential, platelet, bleeding time, PT, PTT, blood grouping , INR (if indicated). Investigations are usually valid only for 6 days. The anesthetist may refer to a pediatrician or other specialists in case of systemic illness. Also intimate that nasal intubation would be preferred.

Pre anaesthetic Preparation

Visit the patient in the ward as soon as possible after admission and Check

medical chart for accuracy in patient background data and consent. Date and time of prospective operation and nature of operation planned to be mentioned along with any medical alerts. Diet description and restrictions should be repeated. Care must be taken not to contradict the instructions of the anaesthetist regarding NPO. In patients with chronic infection, it may be beneficial to start a course of antibiotic earlier.

NPO guidelines for Children

- Clear fluids such as water, juices without pulp, carbonated beverages are allowed up to 2 hours preoperatively. Breast milk upto 4 hrs preoperatively
- Infant formula upto 6 hrs prior to the procedure
- Nonhuman milk upto 6 hrs before the procedure
- A light meal upto 6 hrs before the procedure
- It is permissible for routine medications to be taken with a sip of water

The reasons for these recommendations are as emesis during or immediately after the sedative procedure can result in aspiration of the stomach contents leading to laryngospasm or severe airway obstruction As the sedative agents are

administered by the oral route, drug uptake is maximised when the stomach is empty.

Pre Medication with Chloral hydrate (50-100mg.kg), trimeprazine (2mg.kg) or midazolam (0.5–0.75 mg.kg) may be given orally in children to facilitate a smoother intubation.

Procedure

Anaesthesia

The Anesthetist establishes monitoring devices and IV cannula (if already not in place). Propofol is agent of choice for intravenous induction as it ensures clear headed recovery and good anti-emesis. Then the endotracheal tube is placed and the airway secured. The anaesthetist shall place a throat pack to prevent inadvertent ingestion of any foreign particles especially since uncuffed ET tubes are used for young children. The patient is monitored continuously whilst maintaining the anaesthesia with inhalational agents. At the end of the procedure, after removing the throat pack, administration of reversal of the anaesthetic and return of cough reflex the endotracheal tube is removed.

Pediatric Dentistry

The Team

It is preferable to work as a team of at least three members while administering

treatment under General anaesthesia. A primary surgeon who shall perform most of the procedures. A first assistant, who shall also scrub and assist, mainly involved with retraction, isolation, sequencing procedures. A second assistant who would be primarily responsible for manipulation of restorative materials and handling equipment. In cases which are of very long duration the primary surgeon and first assistant may shift roles in between to ward off fatigue. The one factor which should drive the team is to complete quality dental care in as minimum time as possible.

Positioning the patient

The primary surgeon may choose to perform sitting or standing dentistry and accordingly adjust the height of the table. The child could be positioned with the shoulder raised so as to facilitate a neck extension and head tilt, as this gives a better access especially while practising standing dentistry. Extra oral painting is done and the patient is draped, special care is taken to protect the eyes.

Procedures

The primary surgeon performs a quick oral examination to reconfirm the treatment plan. The procedures are usually performed quadrant wise.

Amount of Local Anaesthesia to be administered is intimated to the anaesthetist. An approximate time required for the procedure to be discussed with the anaesthetist. LA administration helps in reducing intra operative bleeding and post operative discomfort.

Pre-operative intra oral pictures are to be taken. The patient's mouth is opened with the aid of a mouth prop and care should be taken not to impinge on the lips or tongue with the prop. If space maintainer is planned, impression to be taken first after selecting the appropriate size of preformed bands.

Start procedure in the quadrant that has the maximum number of teeth requiring extensive treatment. Extraction procedures to be done first followed by pulp therapies, SSC, restorations preventive resin restorations and preventives procedures like sealant placement.

While performing restorative treatment simultaneous cavity preparation and restoration of all teeth in a quadrant approach is better as it saves time. Whenever the practitioner is in doubt about the depth of a lesion or prognosis of a particular tooth, the worst case scenario is assumed and treatment performed. For example, if after excavation of caries there seems to be a doubt if the caries is

involving the pulp, unlike a chairside scenario where we opt for the most conservative procedure, here it is better to excavate the caries fully and proceed with pulp therapy. The goal should be to perform definitive treatment to avoid a need for re entry or retreatment at a later stage.

It is also advocated that the surgeon make use of rotary endodontics, LASER assisted procedures and other such techniques where indicated all of which would help in faster completion of treatment.

After completion of one quadrant, treatment must follow on the opposite quadrant. Once treatment on one side is completed, the mouth prop is repositioned and treatment performed on the other side. Sutures must be placed in all extraction sites immediately. Fluoride application (varnish preferred) is usually done in the end.

The surgeon should intimate the anaesthetist about 10minutes prior to end of procedure. After all treatments are completed, care must be taken to inspect the oral cavity for any debris or cotton pellets or any restorative material excess in the vestibule or near the throat.

Postoperative

Recovery

Patients are best nursed in left lateral position with a degree of head-down tilt to encourage drainage of any blood and secretions away from the larynx and administered 100% oxygen. The patients are monitored in the recovery area for at least 30 minutes. To avoid the psychological trauma of waking up uncomfortable in a strange place it is important that the parents are present in the post operative care room.

Analgesia

Analgesia is usually given rectally (paracetamol or diclofenac suppositories) during the operation. Ibuprofen or paracetamol may be given orally in liquid form in recovery. Nonsteroidal analgesics are effective.

Post – operative instructions

Post-operative Instructions for General Anesthesia are:

1. Please monitor your child throughout the day following surgery.
2. Do not allow your child to return to school or attend activities following the surgery.

3. Please assist child with walking to the car and to the bathroom. Usually children are drowsy following sedation to prevent them from tipping and falling.

4. It is important that he/she drink liquids throughout the day. Start by giving small amounts of water or clear juices. A couple of hours later begin giving child food, if tolerated. Do not encourage eating too soon because your child's stomach may be upset.

5. You may give your child Children's Ibuprofen every 4-6 hours if needed To reduce the soreness, discomfort, and possible swelling following the treatment.

6. If your child had local anesthetic (numbing), then the child has to be closely watched to prevent him/her from sucking, pinching, or biting his/her lips, cheeks, and tongue.

7. Brushing has to begin the night of the surgery. A wet washcloth may be used instead of a toothbrush to wipe the teeth and gums.

8. If child received any stainless steel crowns his/her gums will be especially sore, because they fit below the gums. Avoid sticky foods. Instructions regarding after care of restorative therapy should be given.

9. If some teeth are removed it is important to avoid spitting, or using a straw for 24 hours. If the area begins to bleed again then have your child bite down on gauze for 15-20 minutes and the pressure will stop the bleeding.

Fitness for discharge

The child may be given clear fluids two hours after procedure. Once the child is awake and alert, displays appropriate behavior, maintains his or her own airway, has stable vital signs, has no uncontrolled bleeding or pain, is voiding, and has no retention of liquids, a decision is made to release the child after consultation with pediatrician with regards to day care patients . **Review**

The child is usually reviewed in the clinic after a week. In case of day care surgery, a telephonic follow up on the day after surgery is preferred. In the review appointment stress upon need to maintain good oral hygiene and patient should be reviewed once every 6months.

Hospital Stay Vs Day care Setting

In most cases unless the child has systemic illness treatment may be safely carried out as a day care procedure. But Caution should be sounded to the parent regarding NPO guidelines pre and post procedure. For patients who undergo minor surgical

procedures or extensive restorations/multiple extractions where edema may be expected the next day, the child could be preferably discharged the next day.

Complications

Injuries to tooth, lip and other soft tissues may occur during laryngoscopy and endotracheal intubation. Dental trauma differs from enamel crack to avulsion. Improper positioning of the prop may lead to soft tissue injury.

Dental pain, difficulty in eating, nasal bleeding, throat discomfort, nose discomfort, sleep alteration, weakness, drowsiness, dehydration, fever, nausea, vomiting, hoarseness, diarrhea and constipation are several reported postoperative discomforts. Post-operative pain is the most common complaint reported.

Advantages of GA

Under GA all required treatments are performed in a single session in a hospital environment providing efficient services in a safe mode. The other benefit of GA does not need child cooperation as one requirement of treatment and the child is spared from a negative experience. Dental GA is more convenient and cost saving than treatment in office setting. It has been reported that dental treatments under GA

have greater quality and durability than conventional treatments which can be attributed to the better access, effective moisture control and undivided attention. Attitude of parents regarding GA have changed over time in the favour of it. Nowadays, there is a shift toward increasing acceptability of GA in parental opinion.

General well-being and quality of life is greatly influenced by oral health, oral health-related quality of life when used as a method to measure the outcome of dental rehabilitation under GA shows significant improvement in their quality of life.

Safety of GA

There has been a lot of concern about safety of providing dental treatment under anaesthesia for children especially after a few media reported cases of deaths following treatment under sedation. There is a marked difference between sedation and general anaesthesia, the latter being much more safer as done in a controlled environment.

There have been FDA warning about possible impaired brain development after exposure of children under age 3 to certain general anesthetics or sedatives, particularly for procedures lasting more than 3 hours. Hence it is prudent for the

practitioner to always weigh the Risk benefit ratio for every procedure and also ensure provision of quality definitive treatment in the shortest possible duration.

It is to be noted that the ethical responsibilities of a treating practitioner (autonomy, justice, beneficence and non-maleficence) towards their patient are maintained whilst providing treatment under GA. Autonomy is established on the respecting the choice of treatment plan drafted before GA. Justice based on fairness in distribution of availability of care. Beneficence (do good) and non-maleficence (do not harm) by analyzing the risk/benefit for each dental procedure. Some decisions are straightforward and easy, others can be very difficult but it has been shown that GA is the safest way of sedation in fact safer than walking on the roads.

To conclude, it may be said that the clinician should aim at effectively and efficiently delivering quality dental care to each of their child patient and should avoid delay in care by repeated fruitless temporary measures.

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Review Article

Oral Potential lesions: A clinical perspective for diagnosis and treatment

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Abstract

Oral cancer is one among the most common cancers in the world, ranking second in India after breast cancer. It accounts for 10.4 % of incidence and 9.3% of death rate annually. Majority of oral squamous cell carcinoma arise from pre invasive lesions which persist within oral cavity for many years with /without symptoms. Oral cavity being an easily accessible site any alterations or abnormalities can be easily detected. Due to lack of awareness and knowledge regarding these lesions, most of them are diagnosed at late stages. Previous data supports that 17% of such premalignant stages show malignant transformation over 7 years. This signifies the importance of identifying such lesions at an earlier stage rather than advanced stages, when treatment options become limited and ineffective.

Thus, clinicians play an important role in identifying the early changes in oral mucosa and educating the patient regarding habit association and early measures to be taken in such conditions. Many management options have been introduced depending on each lesions and patient risk factors. Therefore, updating the preventive and therapeutic measures to manage these lesions is an important requirement by all the general practitioners.

Keywords: Oral potential malignant disorders, Oral leukoplakia, Biopsy, lichen planus

INTRODUCTION

Oral cancer is one among the most common cancer with high rate of mortality and morbidity index. It accounts for 3% of all malignancies, affecting males more than the females¹. The incidence rate varies from one geographical area to other depending on the culture and socioeconomic background. Head and neck cancers are more prevalent in South East Asian countries like Srilanka, Pakistan, Bangladesh and India owing to their increased association with risk factors of cancer. But few cases have been reported showing an increase in incidence of oral cancer in younger individuals with no habit association, but with unknown etiology.

Oral cancer and its precursor lesions have been under monitor by the clinicians and researchers for past several decades. More than 90% of oral carcinoma arises from squamous epithelium of the oral mucosa. Majority of oral cancer cases are preceded by preinvasive stages that may persist for many years². Oral cavity being an easily accessible site for examination, early detection and correct diagnosis of these lesions are utmost necessary to prevent the rate of malignant transformation.

Oral Potential Malignant Disorders (OPMD) and its significance

The concept of premalignancy and its transformation to carcinoma was put forward by James Paget several years ago. Since then several terminologies and definition regarding the precursor lesions have been proposed by various contributors. The commonly used terminology is “*pre-malignant lesion*”, implying that any individual lesion may change into malignancy and “*pre-malignant condition*”, indicating a condition associated with greater than normal risk of cancer development. Recently this terminology was modified in 2005 by WHO to “*potentially malignant disorders*”, signifying that the progression to malignancy is only a potential risk.¹ The earlier terms were abandoned due to lack of clarity. This term signifies that even in cases with defined lesion, the chance of carcinoma arising elsewhere in oral cavity with clinically normal presentation occurs due to field change³. This term was further specified to *potentially pre-malignant oral epithelial lesions* (PPOELs) in 2018 as these are clinically suspicious conditions including erythroplakia, leukoplakia, oral submucous fibrosis and oral lichen planus.⁴

These lesions have a varied clinical presentation there by posing a challenge to clinicians as well as the general public to identify those that have a significant potential risk to malignant transformation. Thus, this review focus on numerous disorders associated with increased risk of squamous cell carcinoma, its early identification with preventive and therapeutic measures to be implemented in clinical practice.

Epidemiology and Etiology

Head & Neck squamous cell carcinoma (HNSCC) ranks the twelfth among other cancers in the world and ranking third in position, in India. The concept behind the transformation of PPOELs to malignancy is still unclear, but a significant increase in cancer progression is observed. Studies show that a small percentage of these lesions change to definite malignancy, remaining either persist as such or enlarge or reduce to smaller size or may even resolve.³ Statistical data reports a prevalence rate of 1- 5% in general public within the age range of 50 – 69 years probably five years prior to development of malignancy. But 5% of cases report the presence of these lesions in individuals younger than 30years.⁵

Most frequently encountered lesions are oral leukoplakia(OL), erythroplakia, proliferative verrucous leukoplakia, actinic cheilosis, oral lichen planus (OLP) and oral submucous fibrosis(OSMF), discoid lupus erythematosus, epidermolysis bullosa and less frequently observed are dyskeratosis congenita, verruciform xanthoma and graft versus host disease.

These lesions predominantly appear in buccal mucosa (70%) followed by gingiva, floor of mouth (42.9%), tongue (24.2%),lip vermilion (24%) and palatal region. Clinically these lesions present as white patch to erythematous area with mixed component. Clinician should be highly skilled to distinguish between high risk and low risk categories as most cases show similar clinical presentation.

Even though the above parameters help in clinical risk assessment, biopsy and histological examination is still the gold standard procedure. Therefore, the clinicians should gain experience in diagnosing the potential lesions at the earliest. The real causative factor for these lesions is unclear yet literature review supports a strong association of habits in most cases of these lesions.

Clinical Features	Parameter	Risk of transformation
Size of lesion	>200 mm ²	High
Texture	Non-Homogenous	High
Colour	Red /Speckled	High
Site	Tongue & Floor of the mouth	High
Sex	Female	Intermediate
Age	Greater than 50 years	Intermediate
Habit	Non-Smoker	Weak

Table 1: Few clinical features associated with increased risk of progression to malignancy³

Tobacco chewing and tobacco consumptions are major etiological factor for oral leukoplakia, OSMF and erythroplakia whereas tobacco smoking is associated with oral leukoplakia.⁶

Alcohol consumption are proven synergist that enhance the rate of development of PPEOLs. Other risk factors include chronic trauma due to ill-fitting denture or tooth, poor hygiene, poor diet, human papilloma infection (HPV), ultraviolet radiation. Most common sites of HNSCC in HPV lesions are tonsils and base of the tongue. Lesions evident in non-smokers have an idiopathic origin or genetic predisposition and are at higher risk to cancer progression.^{7,8}

OPMDs and its clinical presentation

Leukoplakia

A predominantly white lesion or white patch that cannot be clinically or histologically defined as any other disease. This is the most common precursor lesions with a prevalence range of 1.1 and 11.7%, mostly occurs in middle and older age group (Fig 1 A,B). Even though it is more common in males than in females, the latter has higher risk of cancer development.² Leukoplakia is evident six times more in smokers than in nonsmokers. This has varied clinical presentation with different rate of malignant transformation. (Table 2)

Erythroplakia (Erythroplasia, Erythroplasia of Queyrat)

A predominantly red lesion that cannot be clinically or pathologically defined as any other disease. This presents as homogenous, granular, or speckled pattern (Fig 1 C). It has low prevalence rate with one in 2500 cases and predominantly appear in males aged 50 -70 years. Most of the cases are asymptomatic with few reporting burning

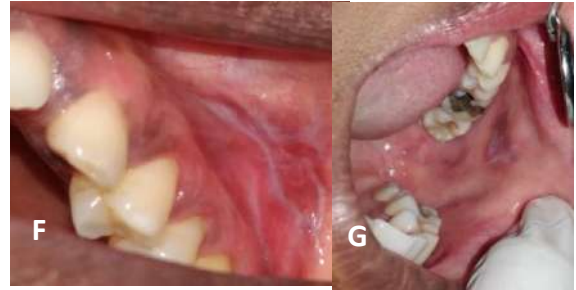
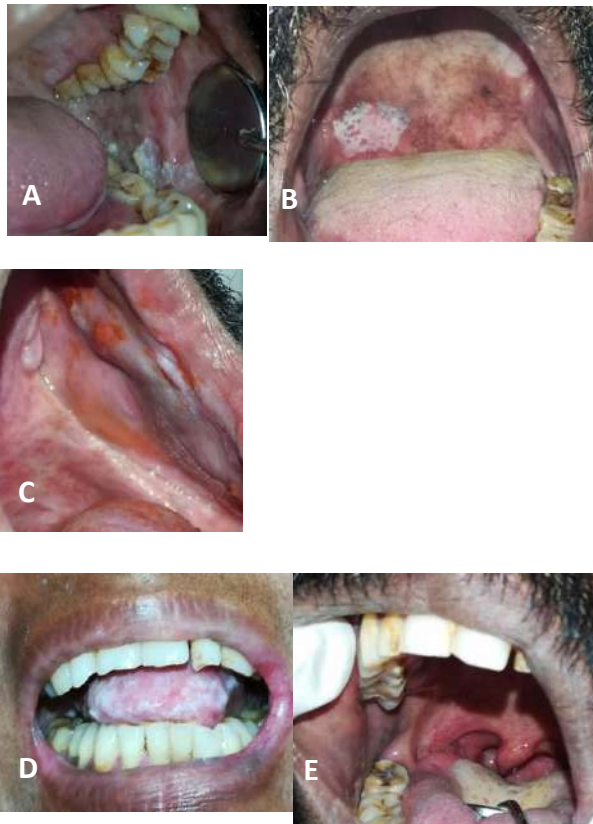


Fig 1: A, B Thick white plaque like appearance on the buccal mucosa. Homogenous white area on the soft palate area (High chance of malignant transformation. C: Erythematous area on the buccal mucosa. D, E Stiffness of mouth associated with white lesion on dorsal surface of tongue. Deviated uvula with blanching oral mucosa. F, G: Linear striae (Wickham's striae) characteristic of Lichen Planus, White lesion adjacent to a restored tooth representative of lichenoid reaction

sensation. Rate of malignant transformation is higher in these lesions. (Table 2)

Shafer and Waldron, in study series of 58 cases, 51 % showed definite invasion, 40% showed CIS or severe epithelial dysplasia and remaining 9 % showed histological appearance of mild and moderate dysplasia.⁹

Proliferative Verrucous Leukoplakia

An exophytic, multifocal recurrent variant of leukoplakia with high rate of malignant transformation. More commonly seen in females (F:M is 4:1) with no history of tobacco use. They appear as white patch /plaque with irregular surface. These lesions tend to spread slowly to other parts of oral mucosa and undergo malignant transformation within 8 years.⁶

Oral Submucous Fibrosis (OSMF)

A chronic progressive scarring disease with mucosal rigidity in advanced stages. This condition is strongly associated with use of betel nut or pan. They clinically present as fibrosis, stiffness, limited mouth opening,

whitening of oral epithelium (Fig 1 D,E). These are predominantly seen in South East Asian population due to consumption of pan products. Evidence shows a greater risk of cancer progression from OSF in presence of epithelial dysplasia as well as with concomitant lesions of leukoplakia.¹⁰

OPMDs	Demographic data	Location	Clinical picture	Malignant Transformation
Leukoplakia Simplex /Homogenous Verrucous Erosive Speckled	M>F	Buccal mucosa, lips and gingival	White plaque /patch	15.6 – 39.2%
Erythroplakia	M>F	Tongue, Floor of mouth, soft palate, buccal mucosa	Erythematous lesion	51%
Oral Submucous Fibrosis	M >F 2 nd -4 th	Buccal mucosa, tongue, soft palate	Whitish greyish white striae	7-26%
Oral Lichen planus	Middle aged F>M	Posterior Buccal mucosa, tongue gingiva, palate	Varied presentation Reticular Erosive, atrophic, bullosa, popular plaque	0.4 -3.7%
Proliferative verrucous leukoplakia	F> M Middle aged	Gingiva	Multifocal white patch with irregular surface	63.3 -100%
Oral verrucous	M>F	Buccal mucosa	Thick white patch	20%

carcinoma				
Epidermolysis bullosa	F>M	Buccal mucosa, palate, tongue	Bullae and vesicle formation	25%
Actinic cheilosis	M>F	Lower lip	Atrophic, erosive	6-10%
Keratoacanthoma	M> F	Lip, Tongue	Firm and nontender nodule with keratin plug at the center	24%
Palatal keratosis with reverse smoking	F>M 3 rd decade	Palate, tongue	White patches with red component in few areas	12.5%

Table 2: Clinical presentation of OPMD

Oral Lichen planus (OLP)

A chronic mucocutaneous disease with varied clinical presentation (Fig 1 F,G). Mostly observed in females of over 40 years (F: M:1.4:1) and frequently associated with cutaneous manifestation (1%). Cutaneous manifestation is commonly observed in ankles, wrist and genitalia but facial skin are mostly spared. These have a clinical manifestation overlapping with Oral lichenoid lesions (OLL) which makes it difficult to distinguish it from the former. Studies states that identifying these two lesions is very much critical as OLL is having a higher malignant rate of 2.5 to 3.9% compared to OLP with 0.9 to 1.09%.^{11,12}

An important role is played by the immunity as well as other associated factors like stress,

medications, systemic disease and HPV infections

Other ill defined OPMDs

Chronic hyperplastic candidiasis

According to latest WHO classification “chronic candidiasis” is described as OPMD. The causation or association of epithelial dysplasia with fungal infection is still under controversy. Studies show that dysplastic lesion associated with Candidiasis has a higher progression rate in subsequent biopsy. Few studies states that candida may be directly involved in carcinogenesis.¹³

Dyskeratosis Congenita (Zinsser - Engman Cole Syndrome)

A rare inherited disease affecting one in 1,000,000, predominantly seen in male than

female (13:1) affecting young individual of 5 – 13 years. It is characterized with classic triad of nail dystrophy, reticular skin pigmentation and oral leukoplakia. The affected areas are buccal mucosa, tongue and oro pharynx. Also associated with periodontal destruction and has a high rate of malignant potential.^{14,15}

Verruciform Xanthoma (VX)

A rare benign lesion with asymptomatic elevated mass with yellow or red colour with verruciform surface texture. Most commonly affects the gingiva, tongue and buccal mucosa, floor of mouth, soft palate and lower lip. Mannes et al described the association of VX with invasive carcinoma.¹⁶

Xeroderma Pigmentosa

A rare autosomal recessive disease associated with cutaneous malignancy. Younger individuals are associated with oral lesions. Association of oral squamous cell carcinoma with xeroderma pigmentosa has been reported by Chidzonga and Palatella.^{17,18}

Few conditions including 3rd stage of syphilis, Iron deficiency Anemia, Immunosuppressive disease and malnutrition also predispose to carcinoma.

Thus a proper knowledge of all these conditions are necessary for planning a proper treatment course.

Management (Table 3)

Management strategies for OPMD fall into three categories: close observation, surgical removal and ablation and medical therapies¹⁹, depending on lesion and patient risk factors. The elimination of etiologic factors always stands as a key aspect in the management of these lesions. An observation period of 2-4 weeks, to detect a possible regression of these lesions, after the elimination of causative factors is recommended²⁰.

Biopsy remains as the gold standard for initial diagnosis and management of lesions. In patients with multifocal or large white lesions/leukoplakia, multiple biopsies from different sites (field mapping) should be considered²¹. An incisional biopsy may not be representative for larger lesions²². For small sized lesions (<2-3cm), excisional biopsy maybe performed. Erythroplakias or red lesions 43 should be excised with a clear margin. Algorithms for the management of OED has been proposed by Villo, 2017²³, Awadallah M,2018²⁴. Biopsy and follow up has been recommended. Mild OED require review yearly, moderate OED - 6 months

review for 2 years and then yearly and severe dysplasia, review every three months for two years. Recurrence rates of 10% to 34% after surgical resection of oral leukoplakia have been reported²⁵

Other various treatment options available include cryosurgery, laser surgery²⁵ administration of retinoids, either topically or systemically²⁶, mouthwash therapy containing an attenuated adenovirus²⁷ and photodynamic therapy (PDT)²⁸.

Laser ablation has also been advocated for eradication of OL²⁵. This approach offers the advantage of reduced scarring, but a major disadvantage includes the lack of a resected specimen for histopathologic and molecular analysis.

Photodynamic therapy is minimally toxic to normal tissue and can be used frequently²⁹. Sensitivity, pain, swelling, burning sensation, taste alterations, ulcerations, and loss of local sensation have been reported, but low in magnitude³⁰.

Treatment with retinoids have reported toxicities, with a very high rate of relapse within 3 months of stopping the treatment³¹.

Other treatment modalities include the use of natural agents with a potential for the treatment of leukoplakia/erythroplakia are Bowman-Birk inhibitor concentrate derived from soybeans³² and green tea extract³³

Green tea extracts with high amounts of polyphenols are high in their antioxidant activity and can protect cells from DNA damage caused by reactive oxygen species³⁵

Lesion	Treatment
Oral Leukoplakia	General recommendation - patient to be placed on review every six months in the first year based on the severity of lesion Risk factor aversion/habit cessation Surgical treatment- cold knife excision, CO2 lasers Combination of excision and laser treatment Antioxidant therapy,

	Immunomodulating therapy, or any combination
Oral erythroplakia	Early surgical intervention, habit cessation, long-term surveillance
OLP	Medical - Topical corticosteroids- triamcinolone acetonide & beclomethasone Topical agents- retinoids, cyclosporine, calcineurin Photodynamic therapy
OSMF	Pharmacologic therapy Anti-inflammatory/ immunomodulators - corticosteroids mainly, interferon- γ , immunized milk and placental extracts
	Antioxidants Polyphenols - byproducts of tea pigments; pentoxyphylline; buflomedil hydrochloride; Carotene, vitamin E, and lycopene
	Surgical therapy Excision and release of fibrotic bands with conventional reconstructive techniques
	Enzymatic degradation Hyaluronidase, collagenase, chymotrypsin

Table 3: The management of OPMDs

Prognosis of OPMD

Association of OPMDs with factors which are found to have been related to increased malignant transformation serves as a prognostic factor. Risk varies according to patient or lesion related factors. The prognosis depends on demographical, clinical and histopathological factors. Demographic factors can be Gender (female), age (Greater than 50), habits (non smokers)³. Clinical factors like size of lesion (greater than 200mm²), texture (nonhomogenous), color (red or speckled), site (tongue or floor of the mouth).³ It has been reported that mild, moderate, and severe dysplasia develop into malignancy in 3%, 4%, and 43%, respectively³⁶

Histologic prognostic factors include rate of dysplasia(severe), HPV (HPV-16+), DNA content(aneuploidy), Loss of Heterozygosity (many genes involved).³

Several other biomarkers like podoplanin, deltaNp63, cyclinD1 genotypes, specific mRNA expression DNA methylation profile, miRNA expression, hTERC (Human telomerase RNA component), ABCG₂ and BMI-1 expression³⁷, EGFR protein, mRNA expression and gene copy number gain has also been found to be associated with higher cancer risk.³⁸

Conclusion

The detection, diagnosis, and management of oral premalignant lesions is very multifaceted. Noninvasive technologies are being developed to assist in localization of abnormal oral mucosa, and in therapy of patients with OPMD. Clinical examination and histopathology remain the "gold standard" for the detection of these lesions and to assess the malignant transformation.

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Review Article

Autofluorescence technology in the early detection of oral precancerous lesions

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Abstract

Oral cancer is a major dental public health problem in India. Majority of the cases are identified at a later stage of the disease resulting in high mortality. The advent of autofluorescence technology has brought about a possibility of early identification of oral precancerous lesions in patients. Future researches would enable the development of a portable and cost-effective oral cancer detection device for conducting oral cancer screening in a community.

Keywords: Oral cancer, Detection, Autofluorescence

Introduction

Oral cancer is a major dental public health problem in the Indian subcontinent where it ranks among the top three types of cancer in the country.¹ Age-adjusted rates of oral cancer in India are high that is, 20 per 100,000 population and accounts for over 30% of all cancers in the country.² The variation in incidence and pattern of the disease can be attributed to the combined effect of ageing of the population, as well as regional differences in the prevalence of

disease-specific risk factors.³ Oral cancer is mostly diagnosed at later stages which result in low treatment outcomes and considerable costs to the patients whom typically cannot afford this type of treatment.⁴ Rural areas in middle- and low-income countries have inadequate access to trained providers and limited health services. As a result, delay has also been largely associated with advanced stages of oral cancer.⁵ Earlier detection of oral cancer offers the best chance for long term survival and has the

potential to improve treatment outcomes and make healthcare affordable.⁶ Oral cancer affects those from the lower socioeconomic groups, that is, people from the lower socioeconomic strata of society due to a higher exposure to risk factors such as the use of tobacco.⁷ Even though clinical diagnosis occurs via examination of the oral cavity and tongue which is accessible by current diagnostic tools, the majority of cases present to a healthcare facility at later stages of cancer subtypes, thereby reducing chances of survival due to delays in diagnosis.⁸ Public health officials, private hospitals, and academic medical centres within India have recognized oral cancer as a grave problem.⁹ Efforts to increase the body of literature on the knowledge of the disease etiology and regional distribution of risk factors have begun gaining momentum. Oral cancer will remain a major health problem and efforts towards early detection, and prevention will reduce this burden. One promising approach to localization of abnormal mucosa, autofluorescence imaging, uses differences in native autofluorescence properties between normal and neoplastic tissue to visually detect abnormal oral mucosal areas. Living tissues contain fluorophores such as NADH(nicotinamide adenine dinucleotide),

FAD(flavin adenine dinucleotide), and collagen and elastin crosslinks that produce fluorescence after excitation with specific light wavelengths.¹⁰ Mucosal abnormalities can alter the absorption and scattering properties of light as a result of changes in tissue architecture and concentration of fluorophores.¹¹

Early detection of neoplastic changes in the oral cavity may be the best method to improve patient quality of life and survival rates. The most common oral precancerous detection devices that have been marketed to dentists include: ViziLite (Zila, Batesville, AR, USA), VELscope (LED Dental Inc., Vancouver, Canada), DIFOTI (Electro-Optical Sciences, Inc., Irvington, NY, USA) and Identafi 3000 (DentaleEZ, Bay Minette, AL, USA).

Identafi

This portable tool has a light source in the form of a probe-like device that resembles a dental mirror and can, following appropriate infection control methods, be easily inserted into the mouth for oral examination. The amber light is designed to enhance the reflective properties of the oral mucosa, allowing a distinction between normal and abnormal tissue vasculature.¹²

The Identafi device has three light sources that can be used for the clinical examination: a white light for regular illumination, a violet light that excites fluorescence at 405 nm for tissue absorption, and green amber light at 545 nm for tissue reflectance. Reflectance spectroscopy uses light within the absorption spectrum of haemoglobin namely, between 400 and 600 nm to visualize the underlying vasculature.¹¹⁻¹⁵

A recent study using the Identafi 3000 for screening of 124 subjects, demonstrated a sensitivity of 82% and a specificity of 87% in differentiating between neoplastic and non-neoplastic oral conditions. Results appeared to vary between sampling depths, and keratinized vs. non-keratinized tissues.¹⁶ Another study using quantitative fluorescence imaging in 56 patients with oral lesions and 11 normal volunteers, showed that healthy tissue could be discriminated from dysplasia and invasive cancer with 95.9% sensitivity and 96.2% specificity in the training set, and with 100% sensitivity and 91.4% specificity in the validation set.¹⁷ A recent study showed that the Identafi device was an aid in identification of oral precancerous lesions during screening of 6966 adults.¹⁸ Further clinical studies are needed in diverse

populations to evaluate fully the clinical usefulness of this promising technology.¹⁹

VELscope

The use of tissue autofluorescence in the screening and diagnosis of precancerous lesions in the lung, uterine cervix and skin has already been well documented. This approach is already in clinical use in the lung, and its mechanism of action and interaction of tissue autofluorescence has been well described in the cervix.²⁰⁻²¹ Using the tissue autofluorescence concept for diagnosis of dysplastic lesions in the oral cavity hinges on the changes in the structure and metabolism of the epithelium and the subepithelial stroma when interacting with light. Specifically, loss of autofluorescence in dysplastic and cancerous tissue is believed to reflect a complex mixture of alterations to intrinsic tissue fluorophore distribution, due to tissue remodeling such as the breakdown of the collagen matrix and elastin composition as well as alterations to metabolism such as the decrease in flavin adenine dinucleotide concentration, and increase the reduction form of nicotinamide adenine dinucleotide associated with progression of the disease.²²⁻²⁴ Further, these structural changes in tissue morphology are associated with alterations not only in the

epithelium but also in the lamina propria (e.g., thickening of the epithelium, hyperchromatin and increased cellular/nuclear pleomorphism, or increased microvasculature). The latter changes lead to increased absorption and/or scattering of light, which in turn reduces and modifies the VELscope System. It is a simple hand-held fluorescence visualization tool for the direct visualization of tissue fluorescence, and it is quick and easy to use. The site of interest is viewed through the instrument eyepiece. Normal oral mucosa appears pale green due to the tissue autofluorescence resulting from stimulation with intense blue light excitation at 400–460 nm wavelength. In contrast, dysplastic and malignant lesions will appear darker than the surrounding healthy tissues as they have decreased autofluorescence.²⁶⁻²⁸

Two recent studies emphasized the controversial use of this system for early diagnosis. One study, demonstrated that VELscope examination did not provide a definitive diagnosis regarding the presence of epithelial dysplasia, and that loss of autofluorescence is not useful in diagnosing epithelial dysplasia without relevant clinical interpretation.²⁹ While the other study showed that the VELscope was useful in confirming the presence of oral leukoplakia and erythroplakia and other oral mucosal

detectable autofluorescence signal.²⁵ In the past decade, several forms of autofluorescence technology have been developed for inspection of the oral mucosa. In partnership with the British Columbia Cancer Agency, LED Medical Diagnostics Inc markets the hand-held disorders, but the device was unable to discriminate high-risk from low-risk lesions.³⁰

Vizilite

This imaging device has been approved for use in the United States by the Food and Drug Administration since 2001. It involves the use

of a hand-held, single-use, disposable chemiluminescent light stick that emits light at 430, 540 and 580 nm wavelengths. The use of the light stick is intended to improve the visual distinction between normal mucosa and oral white lesions. Normal epithelium will absorb light and appear dark whereas hyperkeratinized or dysplastic lesions appear white. The difference in color could be related to altered epithelial thickness, or to the higher density of nuclear content and mitochondrial matrix that preferentially reflect light in the pathological tissues.³¹⁻³² Lately, a combination of both

TB and ViziLite systems (ViziLite Plus with TBlue System; Zila, Batesville, AR, USA), received Food and Drug Administration clearance as an adjunct to visual examination of the oral cavity. A recent study of high risk patients showed that the majority of lesions with a histological diagnosis of dysplasia or carcinoma in situ were detected and mapped using ViziLite with TB.³³ Another new chemiluminescence device (MicroLuxDL; Zila, Batesville, AR, lesions in the oral cavity. Further researches would help in the development of a low-cost oral cancer detection device which would enable all dentists to include the device in their routine dental practise thereby enabling the early detection of cases.

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When safety becomes a priority ; An extra mile is worth it !

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Abstract

Sterilization of the root canal system is the primary goal of endodontic treatment. Hence, it is necessary to remove the necrotic tissue and microorganisms during the root canal treatment. Irrigation forms a vital part of root canal debridement. Today's irrigation armamentarium presents a diverse variety of devices that can assist the practitioner in eliminating bacteria and debris within the complexities of the root canal. Regarding the safety factors, ease of application and the efficacy, the newer irrigation devices have changed the insight of conventional endodontic treatment.

Keywords: Irrigant extrusion, Irrigation Devices, Positive pressure irrigation, Negative pressure irrigation.

Dental caries and its entire sequelae have micro-organisms to account for its etiopathogenesis. Understanding these organisms and their etiopathogenesis in relation to the root canal system remains till date the most important factor in treating the sequelae of dental caries. Complete removal of all microorganisms from the pulp chamber, pulp canals and the periapical area is the goal that every dentist aims for.

Root canal treatment has gradually evolved over the years trying to achieve this primary goal by using newer agents that have been fine tuned to maximise the advantages while limiting their potential drawbacks. Achieving this goal has proved to be quite challenging even with the advent of scientific technological advances because of the intricate anatomy of root canal system including fins, isthmuses, large lateral canals and also large areas in oval and flat canals which may remain untouched despite

careful instrumentation (*fig:1- micro CT image of complex root canal anatomy*). Complexity of root canal system limits the biomechanical preparation and complete removal of necrotic pulp tissue difficult, making close adaptation of the obturation material inadequate.

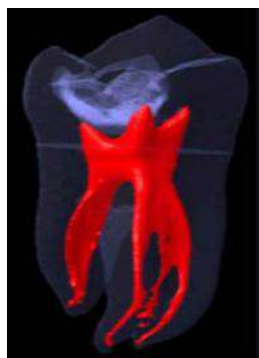


Fig 1

Irrigation is an essential part of root canal debridement. It allows for cleaning beyond what might be achieved by root canal instrumentation alone. It helps by killing microorganisms, flushing debris and removing the smear layer from the root canal system². Factors that remain a challenge in the irrigation and disinfection of the root canal include biofilm resistance, poor penetration of the irrigant, and difficulty in exchange of irrigants in the highly complex root canal anatomy.

There is no one unique irrigant that can meet all the requirements of an ideal one, even with the use of methods such as lowering the pH, increasing the temperature, as well as addition of surfactants to increase

the wetting efficacy of the irrigant. These irrigants must be brought into direct contact with the entire canal wall surfaces for effective action, particularly for the apical portions of small root canals. Progress is in the search for better irrigants and irrigant delivery systems to achieve better debridement and to ensure safety of the periapical region.

This article aims to make a review on various endodontic irrigation systems and its role in endodontic disinfection.

Types of endodontic irrigation systems:

Endodontic irrigation systems can be broadly categorized as manual agitation and machine assisted agitation techniques³(Fig 2)

I. Manual irrigation:

They are positive pressure systems. Such devices are not attached to any suction pressure systems.

i) Syringe irrigation with needles:

Conventional irrigation with syringes has been advocated as an efficient method of irrigant delivery before the advent of passive ultrasonic activation. The technique involves dispensing of an irrigant into a canal through needles of variable gauges, either passively or with agitation. The latter is achieved by moving the needle up and down the

canal space. Irrigation tip gauge and tip design can have a significant impact on the irrigation flow pattern, flow velocity, depth of penetration, and pressure on the walls and apex of the canal.

Replenishment and fluid exchange do not extend much beyond the tip of

the irrigating needle. Vapourlock, that is the trapped air in the apical third of root canals might also hinder the exchange of irrigants and affect the debridement efficacy of irrigants. That

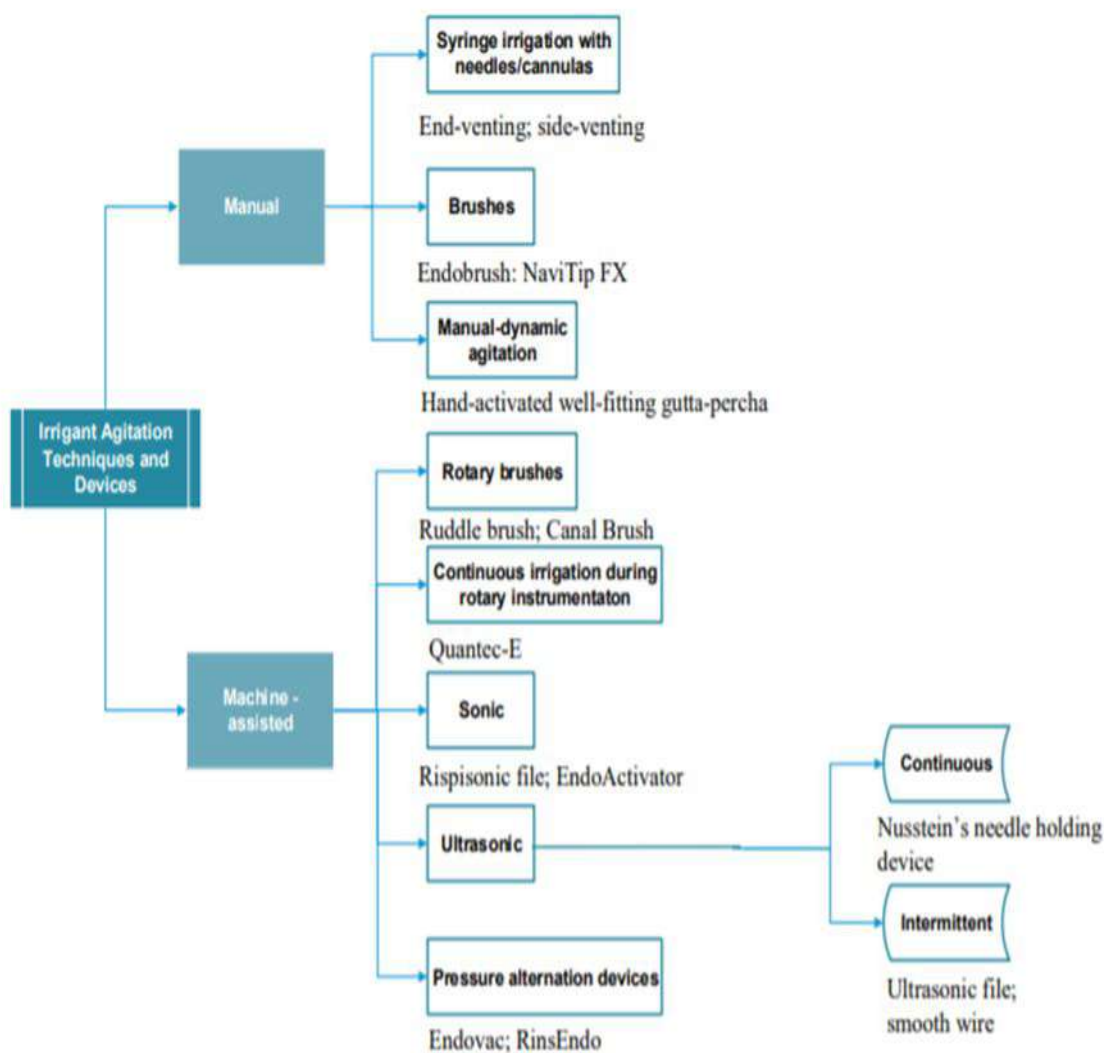


Fig 2: Classification of irrigation systems

is why irrigant delivery devices have been proposed to increase the flow and distribution of irrigating solutions within the root canal system.

ii) **Syringe irrigation with endodontic brushes (NaviTip FX, endobrush)**

Brushes are not directly used for delivering an irrigant into the canal spaces. They are adjuncts that have been designed for debridement of the canal walls or agitation of root canal irrigant. However, the Endobrush could not be used to full working length because of its size, which might lead to packing of debris into the apical section of the canal after brushing. Also, friction created between the brush bristles and the canal irregularities might result in the dislodgement of the radiolucent bristles in the canals that are not easily recognized by clinicians, even with the use of a surgical microscope.

iii) **Manual dynamic irrigation.**

Well-fitting gutta-percha master cone up and down in short 2 to 3 mm strokes (manual dynamic irrigation) within an instrumented canal can produce an effective hydrodynamic effect and significantly improve the displacement and exchange of any given reagent. Studies demonstrated that manual-dynamic irrigation was significantly

more effective than an automated-dynamic irrigation system^{2,10}. But it is more laborious. The frequency of push-pull motion of the gutta-percha point (3.3 Hz, 100 strokes per 30 seconds) is higher than the frequency (1.6 Hz) of hydrodynamic pressure generated by a machine assisted system (Rins Endo).

II. **Machine assisted irrigation**

- i) Rotary Brush
- ii) Continuous irrigation during rotary instrumentation
- iii) Sonic devices like the EndoActivator, Vibringe
- iv) Ultrasonic devices
- v) Pressure Alteration Device

Among these, the first four systems are not connected to any suction systems. While, the pressure alteration devices work based on negative pressure created by suction system to which they are attached.

- i) **Rotary Brush:** rotary hand piece-attached micro-brush has been used to facilitate debris and smear layer removal from instrumented root canals. The brush includes a shaft and a tapered brush section. The latter has multiple bristles extending radially from a central wire core. During the debridement phase, the micro-brush rotates at about 300 rpm, causing the bristles to deform into the irregularities

of the preparation. This helps to displace residual debris out of the canal in a coronal direction.

ii) Continuous irrigation during rotary instrumentation: It includes a self-contained fluid delivery unit that is attached to the Quantec-E Endo System. It uses a pump console, 2 irrigation reservoirs, and tubing to provide continuous irrigation during rotary instrumentation. Used for continuous irrigant agitation during active rotary instrumentation, that would generate an increased volume of irrigant, increase irrigant contact time, and facilitate greater depth of irrigant penetration inside the root canal. This should result in more effective canal debridement compared with syringe needle irrigation.

iii) Sonic devices: Sonic activation has been shown to be an effective method for disinfecting root canals. Sonic irrigation operates at a lower frequency (1–6 kHz) and produces smaller shear stresses than ultrasonic irrigation.

The EndoActivator is one form of the sonic irrigation that uses noncutting polymer tips to quickly and vigorously agitate irrigant solutions during treatment.

Vibringe (Vibringe BV, Amsterdam, The Netherlands) is a new sonic irrigation system that combines battery-

driven vibrations (9000 cpm) with manually operated irrigation of the root canal. Vibringe uses the traditional type of syringe/needle delivery but adds sonic vibration.

iv) Ultrasonic devices: *Two types of ultrasonic irrigation.*

The first type is combination of **simultaneous ultrasonic instrumentation and irrigation (UI)**.

The second type, often referred to as **passive ultrasonic irrigation (PUI)**, operates without simultaneous instrumentation.

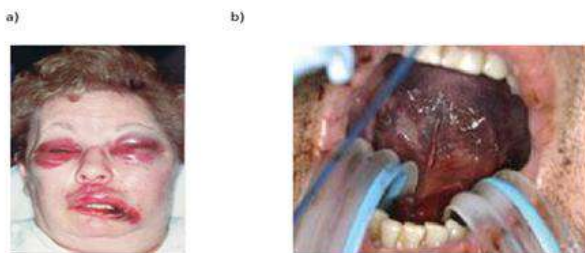
During PUI, the energy is transmitted from an oscillating file or a smooth wire to the irrigant in the root canal by means of ultrasonic waves. The latter induces acoustic streaming and cavitation of the irrigant.

Two flushing methods might be used during PUI, namely a **continuous flush** of irrigant from the ultrasonic hand piece or an **intermittent flush** of irrigant from the ultrasonic hand piece

In Intermittent flushed ultrasonic irrigation, the irrigant is delivered to the root canal by a syringe needle. The irrigant is then activated with the use of an ultrasonically oscillating instrument. The root canal is then flushed with fresh irrigant to remove the dislodged or dissolved remnants from the canal walls. PUI is more effective than

syringe needle irrigation at removing pulpal tissue remnants and dentine debris¹. This may be due to the much higher velocity and volume of irrigant flow that are created in the canal during ultrasonic irrigation. Ultrasonic can effectively clean debris and bacteria from the root canal system, but cannot effectively get through the apical vaporlock. One of the major problems associated with these positive pressure techniques is irrigant and debris extrusion.

- v) **Pressure Alteration Devices:** It includes Rinsendo and Endo-vac system. These systems stand as a solution for irrigant and debris extrusion. The flare-up phenomenon during endodontic treatment due to debris extrusion and hypochlorite accidents has been a persistent problem over the years. Sodium hypochlorite which is considered as benchmark among endodontic irrigants carries risk of extrusion into periapical tissues



a) Facial haematoma

b) Sublingual hematoma.

causing inflammation, ecchymoses, hematoma, and sometimes even necrosis and paraesthesia.

Pressure Alteration Devices creates negative pressure by suction method. It is used to pull back the chemical solutions injected into canal space from the reservoir using high-speed suction. Thus it prevents both dentinal debris and irrigant extrusion.

Endovac and Rins-endo system belong to this category. Endovac is found to be more effective and ensures much safety while working near the root apex of instrumented root canals .

❖ **Rinsendo system:**

The RinsEndo system irrigates the canal by using pressure-suction technology developed by Durr Dental Co. Its components are a hand piece, a cannula with a 7 mm exit aperture, and a syringe carrying irrigant.

- The hand piece is powered by a dental air compressor and has an irrigation speed of 6.2 ml/min. With this system, 65 mL of a rinsing solution oscillating at a frequency of 1.6 Hz is drawn from an attached syringe and transported to the root canal via an adapted cannula.
- During the suction phase, the used solution and air are

extracted from the root canal and automatically merged with fresh rinsing solution. The pressure-suction cycles change approximately 100 times per minute.

- The manufacturer of RinsEndo claims that the apical third of the canal might be effectively rinsed, with the cannula restricted to the coronal third of the root canal because of the pulsating nature of the fluid flow.

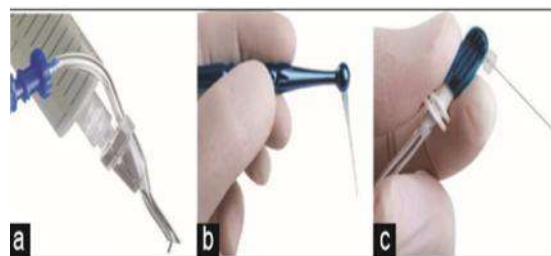
McGill et al evaluated the effectiveness of RinseEndo system in a split tooth model. They found to be less effective in removing the stained collagen from root canal walls when compared with manual-dynamic irrigation by hand agitation of the instrumented canals with well-fitting gutta-percha points.

❖ Endovac system:

The EndoVac apical negative pressure irrigation system has been introduced by Discus Dental Company.

It has three components: a) The Master Delivery Tip

b) MacroCannula c) MicroCannula.



a) **The Master Delivery Tip** : simultaneously delivers and evacuates the irrigant.

b) **The MacroCannula**: used to suction irrigant from the chamber to the coronal and middle segments of the canal. The MacroCannula or MicroCannula is connected via tubing to the high-speed suction of a dental unit. The Master Delivery Tip is connected to a syringe of irrigant and the evacuation hood is connected via tubing to the high-speed suction of a dental unit. The plastic macrocannula is a size 55 open end with a .02 taper and is attached to a titanium handle for gross, initial flushing of the coronal part of the root canal.

c) **The Micro Cannula**: The size 32 stainless steel micro cannula has 4 sets of 3 laser-cut, laterally positioned, offset holes adjacent to its closed end. This is attached to a titanium finger-piece for irrigation and evacuation of the irrigant from the apical part of the canal by positioning it at the working length. The micro cannula can be used in canals that are enlarged to size 35 or larger.

During irrigation, the master tip delivers irrigant to the pulp chamber and siphons off the excess irrigant to prevent overflow. Either the micro or macro cannula in the canal simultaneously exerts negative pressure that pulls irrigant from its fresh supply in the pulp chamber, down the canal to the tip of the cannula, into the cannula, and out through the suction hose. Thus, a constant flow of fresh irrigant is being delivered by negative pressure to working length. Apical negative pressure has been shown to enable irrigants to reach the apical third and help overcome the issue of apical vapor lock.

In studies comparing the efficacy of EndoVac with other systems, the EndoVac was capable of better disinfection of the isthmus area with least extrusion⁷. Apart from being able to avoid air entrapment, the EndoVac system is also advantageous in its ability to safely deliver irrigants to working length without causing their undue extrusion into the periapical region, thereby avoiding sodium hypochlorite accidents. It is important to note that Endovac is possible to create positive pressure in the pulp canal if the Master Delivery Tip is not positioned directed to axial wall of pulp chamber and micro or macro cannulas are not used simultaneously, which would create the risk of a sodium hypochlorite accident. The manufacturer's instructions must be

followed for correct use of the Master Delivery Tip.

Advancements in root canal disinfection include laser activation and ozone based delivery systems.

CONCLUSION

The clinician must be able to deliver antimicrobial and tissue solvent solutions in predictable volumes safely to the entire root canal system in order to achieve complete eradication of pulp debris and pathogenic microbes present. Newer technologies which enhance efficacy and reach of these irrigants to entire root canal system have facilitated the goal of disinfection in endodontic therapy. Fear of procedural error attributed to full strength NaOCl extrusion might cause clinicians to limit its use. Recommendations for avoiding NaOCl accidents include not binding the needle in the canal, not placing the needle close to working length and using a gentle flow rate.

During conventional root canal irrigation, clinicians must be careful in determining how far an irrigation needle is placed into the canal. The newer systems like EndoVac is advantageous in its ability to safely deliver irrigants to working length without causing their undue extrusion into the periapical region.

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*Review Article***ORAL MANIFESTATIONS OF GENODERMATOSES: A REVIEW**

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ABSTRACT

Genodermatoses consist to an inherited skin disorder related with structure and function. Several genodermatoses present with multisystem involvement lead to increased morbidity and mortality. Many of these disorders have oral manifestations, called oral genodermatoses.

Keywords: Oral Manifestation, Genodermatoses, Genetic

INTRODUCTION

Genodermatoses refers to a group of inherited monogenic disorders with dermatological phenotype. Many of these disorders are rare and also present with oral manifestations called oral genodermatoses.¹ The epidermis of the skin and the components of oral cavity are derived from a common embryologic neural origin of the ectoderm. As a result, there exist many cutaneous diseases which find their manifestations in the oral cavity

affecting the oral mucosa and dentition². Oral disorders might differ from developmental disturbances of hard and soft tissues to precancerous and cancerous lesions.³ Even though most genodermatoses manifest early, during the neonatal period, infancy or early childhood, some conditions can present later in life during adolescence or adulthood. Diagnosis of genodermatoses can be very perplexing, requiring both clinical and investigational correlation to attain a diagnosis.⁴

Therefore, it is of paramount importance for a dentist to recognize that not only some dermatoses exhibit concomitant lesions of the oral mucous membranes but also manifestations of some diseases may be preceded by oral

lesions. This article provides a focused review of genetic basis of important genodermatoses that affect the oral cavity and also have prominent associated dermatologic feature.

CLASSIFICATION

Proposed classification of oral genodermatoses by **Manika Arora and Deepa Mane** (*Journal of the College of Physicians and Surgeons Pakistan* 2016)

1. Genodermatoses affecting teeth and dentition	2. Genodermatoses affecting periodontium and gingiva	3. Genodermatoses affecting oral mucosa
<ul style="list-style-type: none"> • Ichthyosis • Sjogren-Larsson syndrome • Incontinentia pigmenti • Ehlers Danlos syndrome • Focal dermal hypoplasia syndrome • Gardner syndrome • Ectodermal dysplasia • Job syndrome 	<ul style="list-style-type: none"> • Ichthyosis • Sjogren-Larsson syndrome • Papillon-Lefevre syndrome • Tuberous sclerosis • Chediak-Higashi syndrome • Ehlers Danlos syndrome • Focal dermal hypoplasia syndrome 	<ul style="list-style-type: none"> • Darier's disease • Neurofibromatosis type 1 and 2 • Chediak-Higashi syndrome • Ehlers Danlos syndrome • Lipid proteinosis • Focal dermal hypoplasia syndrome • Cowden syndrome • Pachonychia congenita • Epidermolysis bullosa • MEN syndrome • White sponge nevus

4. Genodermatoses affecting jaw bones and facies	5. Genodermatoses causing pigmentation of oral mucosa	6. Genodermatoses with malignant potential
<ul style="list-style-type: none"> • Mccune-Albright syndrome • Ehlers Danlos syndrome • Marfan syndrome •Focal dermal hypoplasia syndrome • Gardner syndrome • Basal cell nevus syndrome •Orofacial digital syndrome type I 	<ul style="list-style-type: none"> • Carney complex • Neurofibromatosis type 1 and 2 • Mccune-Albright syndrome • Lipid proteinosis • Pseudoxanthoma elasticum • Peutz-Jeghers syndrome •Congenital erythropoetic porphyria • Hypomelanosis of ito • Sturge-Weber syndrome •Hereditary hemorrhagic telangiectasia syndrome 	<ul style="list-style-type: none"> • Xeroderma pigmentosum • Dyskeratosis congenita

There are many genetic disorders affecting the mouth and adjoining areas. Few of them along with their oral manifestations have been discussed:

ECTODERMAL DYSPLASIA

Ectodermal dysplasia (ED) is defined as “congenital disorders characterized by alterations in two or more ectodermal structures, at least involving one in hair, teeth, nails, or sweat glands”.⁵ It is an inherited X-linked recessive trait associated with the repressed expression of a gene on the X-chromosome in the positions from q13 to q21.⁶ The most commonly reported manifestation is

hypohidrotic dysplasia, also termed *Christ-Siemens- Touraine syndrome and anhydrotic dysplasia*. Patients reporting with this form of ectodermal dysplasia display the following clinical traits: hypotrichosis, hypohidrosis, and cranial abnormalities.

Oral Manifestations: Abnormalities in the development of tooth buds result in hypodontia and peg-shaped or pointed teeth.⁷⁻⁸ Hypodontia may lead to an

inappropriate development of the alveolar process, leading to a reduction in the vertical dimension, alveolar ridge atrophy (knife blade), labial protuberance and feeding impairment.⁹

PAPILLON LEFEVRE SYNDROME

Papillon-Lefèvre syndrome (PLS) is a very rare genodermatosis of autosomal-recessive inheritance. PLS is genetic, resulting from mutations on both alleles of the cathepsin C gene (CTSC) on chromosome 11q14.2. It is characterized by a hyperkeratosis of soles of feet and palms of the hands (palmar-plantar).

Oral Manifestations: Characterised by extensive, severe, aggressive, and prepubertal periodontitis, leading to premature loss in both deciduous and permanent dentitions.¹⁰ Once the primary and permanent teeth erupted, the gingiva becomes red, severely inflamed, tender and bleeds easily. This is followed by the formation of deep pathological periodontal pockets which exudates pus on slightest pressure. Other characteristic signs include dense plaque accumulation, multiple gingival abscesses, purulent exudates, teeth mobility, drifting, migration and severe alveolar bone resorption with about 10%-15% bone left over around the teeth present.¹¹

EHLERS DANLOS SYNDROME

Ehlers-Danlos syndrome (EDS) is a hereditary collagen disease presenting mainly as dermatological and joint disorders. Other evocative terms include *“elastic man” (or woman) or “India rubber man”*. Manifestations include presence of scarring on the chin and forehead, a history of recurrent luxations of the TMJ, hypertelorism, a narrow curved nose, scarce hair and hyperelasticity of the skin.

Oral Manifestations: The oral mucosa being fragile tears easily when touched by instruments making treatments such as prophylaxis, periodontal surgery or extraction extremely difficult. Hemorrhage may be difficult to control during surgical procedures. Early-onset generalized periodontitis is one of the most significant oral manifestations of the syndrome leading to the premature loss of deciduous and permanent teeth. Teeth present with hypoplasia of the enamel. Radiographic examination often reveals pulp stones and roots that are short and deformed. The tongue is very supple. Approximately 50% of those with the syndrome can touch the end of their nose with their tongue (**Gorlin’s sign**). Palate is highly vaulted.¹²

GARDNER SYNDROME

Gardner's syndrome is a rare autosomal dominant inherited disorder caused by a gene mutation located at chromosome 5 resulting with a high degree of penetrance characterized by the triad of colonic polyposis, multiple osteomas and mesenchymal tumors of the skin and soft tissues.¹³

Oral Manifestations: Impacted or unerupted teeth, congenitally missing teeth, supernumerary teeth, hypercementosis, dentigerous cysts, fused molar roots, long and tapered molar roots, hypodontia, compound odontomes, and multiple caries. Ankylosis of teeth leads to difficulties in extraction.¹⁴

COWDEN SYNDROME

Cowden's disease is an extremely rare, autosomal dominant hereditary disease characterized by the presence of mucocutaneous lesions, hamartomatous with visceral involvement and with the formation of malignant neoplasia.¹⁵ Loss of expression of PTEN a tumour suppressor gene localised to chromosome 10q23.3, is observed in most cases.¹⁶

Oral Manifestations: The most common is in the form of multiple fibro-epithelial polyps. Other manifestations include nodular gingival hyperplasia, a high-arched palate, fissuring and lobulation of

the tongue and, rarely, oral squamous cell carcinoma.¹⁶ Oral fibromas may also present as smooth whitish-pink papules on the mucosa of the oral cavity, when arranged in groups they give rise to a typical *cobblestone image*.¹⁵

DARIER'S DISEASE

Also known as keratosis follicularis, is an autosomal dominantly inherited genodermatosis characterized by greasy hyperkeratotic papules in seborrheic regions, nail abnormalities and mucous membrane changes. DD is said to be caused due to mutations of ATP2A2 gene, which encodes the sarco/endoplasmic reticulum Ca^{2+} ATPase isoform 2 (SERCA2 protein).

Oral Manifestations: Lesions are represented by multiple firm papules with normal, whitish or reddish color, primarily affecting the palatal and alveolar mucosa. Initially, papules are reddish and may coalesce, forming crusts that may be ulcerated.¹⁷

CHEDIAK-HIGASHI SYNDROME

Chediak-Higashi syndrome (CHS), a rare childhood hereditary disorder caused by mutations in the lysosomal trafficking regulator gene (LYST), can be life threatening if left untreated.

Oral Manifestations: The periodontal condition in CHS manifests as early onset

periodontitis with premature exfoliation of both dentitions. Presence of bone resorption either local or generalized, and are related to the gingival inflammation.¹⁸

JOB SYNDROME

Also known as Hyperimmunoglobulin E syndrome (HIES), is a rare primary immunodeficiency characterized by eczema, recurrent skin and lung infections, raised serum IgE, and connective tissue and skeletal abnormalities.

Oral Manifestations: Retained primary dentition, a high arched palate, variations of the oral mucosa and gingiva, and recurrent oral candidiasis.¹⁹

XERODERMA PIGMENTOSUM

Xeroderma Pigmentosum is an autosomal recessive genetic disorder characterized by defective DNA repair leading to clinical and cellular hypersensitivity to UV radiation and carcinogenic agents. Important clinical features are intense cutaneous photosensitivity, poikiloderma, actinic keratosis, acute burning under minimal sun exposure, erythemas, hyperpigmented lentiginous macules, and malignant lesions in sun-exposed areas, including basocellular carcinoma, squamous cell carcinoma, and melanoma.

Oral Manifestations: Actinic cheilitis is a potentially malignant lesion that affects the lower lip. Pain is a consequence of fibrous area that stretches when the patients open the mouth for feeding, speaking, breathing and for maintaining oral hygiene. Therefore, the patient has poor hygiene habits and subsequently, a high rate of dental plaque, caries and periodontal disease.²⁰

DYSKERATOSIS CONGENITA

Dyskeratosis congenita (DC) is a rare X-linked recessive inherited disorder which affects mainly males and is caused by mutation of the DKC1 gene at the Xq28 site.

Oral Manifestations: Hypodontia, short blunted roots, hypocalcification, thin enamel, gingival recession, gingival inflammation with oedema, gingival bleeding, alveolar bone loss, periodontitis, extensive caries, smooth atrophic tongue mucosa, leukoplakia, and lichen planus.²¹

CONCLUSION

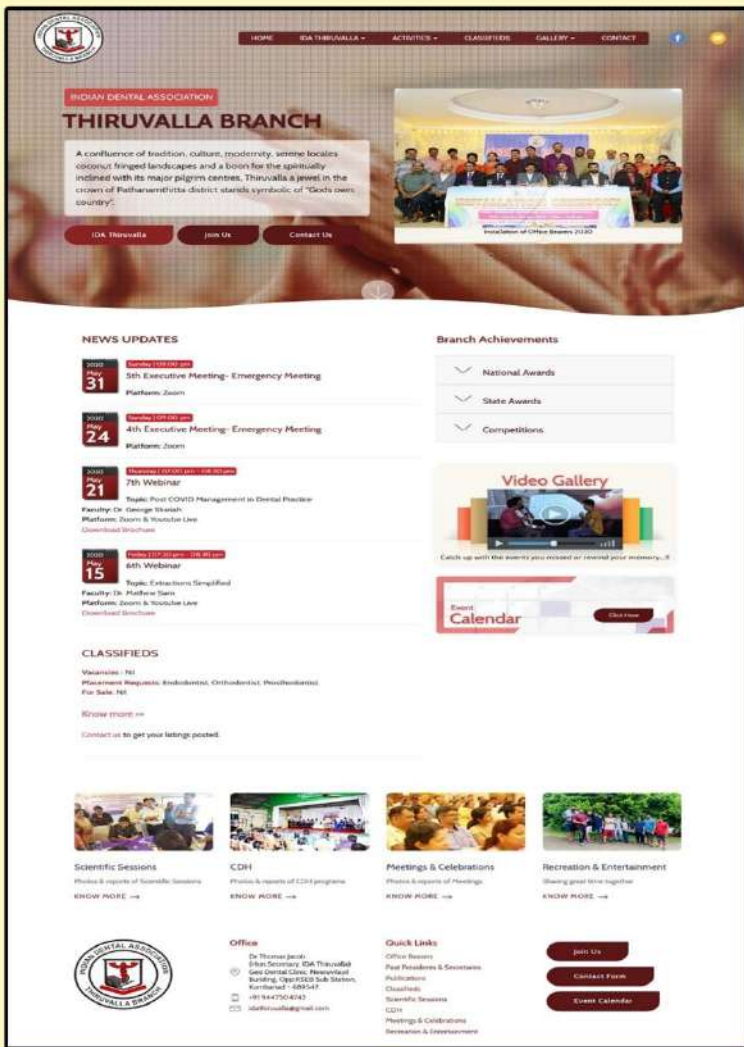
At present, there is better understanding of the genetic basis of genodermatoses with incredible progress in their molecular diagnosis. Definitive diagnosis of most of the genodermatoses is difficult, therefore clinical insight of the physician with appropriate diagnostic algorithm for each disorder is helpful to reach a provisional

diagnosis; however, management is symptomatic in most of the cases. Genetic counselling and prenatal diagnostic facilities bring a ray of hope to affected families.

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