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# DENTAL LAMINA

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**MANAV RACHNA**  
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**“DENTAL LAMINA”**

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The majority of today's patients are digitally connected in various areas of their lives. Over the past several years, dentistry has been moving at varying speeds into the digital arena. An increasing number of dental offices/establishments have moved to the digital platform to assist patients in achieving their health goals and to improve efficiency, communication and profitability. Practice management software, digital radiography, voice-activated perio-chatting, intraoral camera and CAD/CAM dentistry have enhanced the patient experience.

Digitization in radiology has reduced radiation exposure levels by upto as much as 85%. Their fast acquisition time means immediate feedback. This helps to nurture a more symbiotic dentist-patient relationship. For a successful transition to a paperless dental set-up training is essential. Failure to train may end in “surviving “the software rather than using it to its fullest potential to benefit the dental team and patients.

Becoming a paperless dental setup reduces expenses , saves time, simplifies organization, improves patient communication and helps save our environment. This ensures that every interaction regarding a patient visit- from initial initial contact through reimbursement – can be handled quickly and efficiently with the help of digital technology.

**Dr. Shveta Sood**  
Editor In Chief



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# KNOWLEDGE REGARDING DRUG PRESCRIPTION : A SURVEY AMONG DENTAL STUDENTS

## Abstract

A survey has been done in MRDC dental students to analyze the knowledge and awareness of various drugs prescribed during treatment of patients. A randomized study was conducted in 26 students out of 44 students doing internship in Manav Rachna Dental College, Faridabad.

The data was categorized on the basis of common dental causes of medication, common NSAIDs prescribed, common antibiotics prescribed to the patients, sources of information utilized by interns for prescribing drugs and dosage, and to know various tools they use to update themselves.

From the survey it has been observed that most of the students prescribe only amoxicillin and amoxicillin + clavulanic acid combination as antibiotics. It has also been observed that most students refer textbooks (60%) as a source of information for prescription, and out of the remaining 40%, 25% of the students consult senior faculty and 15% students update of their knowledge through internet.

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**Keywords:** Pain, Analgesic, Antibiotic, NSAIDs

## Introduction

Drug therapy is the main tool that enables doctors (4), for promoting, maintaining and restoring health of the patients. Drugs can offer treatment and manage illness, and can also cause adverse drug reactions. The initial intervention that doctors offers for the benefit of the patient is through examination of the patient, investigations and prescribing certain drugs. Knowledge about drugs is the main key for every medical and dental graduate, and one has to always be updated with the upcoming knowledge to ensure safe recovery of the patient in the shortest duration.

Many doctors are unaware that errors in prescribing the drugs can lead to harmful effects to the patients and may also contribute to various problems. Rational drug prescription is defined as using the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost (3, 5). Prescribing the drugs forms a part of health care program. The care and treatment provided to the patient should be compatible with any other treatment/s the patient is receiving (7). The drug prescribing patterns may be influenced by social, cultural and economic factors (1).

As dental prescriptions provide a short term treatment or treatment specifically for pre- and post-surgical procedures, and improving the quality of dental prescription would reduce the medication errors and will promote rational use of pharmacotherapy, and patient safety (2). The most commonly prescribed drugs in dental practice are NSAIDs, antibiotics and local anesthetics used during dental procedures. Therefore, proper and adequate knowledge about these drugs, its accurate dose and adverse effects is important. Thus, knowledge regarding the same is of utmost importance in the undergraduate teaching curriculum where students learn about the art of prescription writing and different drug formulations (6). Hence, the study was done to assess the knowledge of drugs when prescribing to the patients.

## Aim

The aim of the pilot study was to analyze information obtained from the students regarding various drugs prescribed to the patients, and the sources of their knowledge. This would enable us to know what steps can be taken in future for better knowledge and patient management.

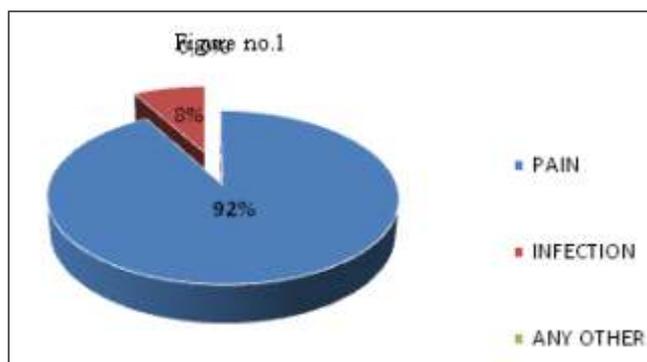
## Methodology

This study was done by randomly selecting 26 students out of 44 students from the Intern batch of Manav Rachna Dental College. A verbal consent was taken from all the participants before commencement of the study of common causes of medication, most common NSAIDs prescribed by MRDC students, most common antibiotics prescribed, sources of information regarding drugs and dosage, duration of drugs and internet as source of information to update their knowledge.

## Observation And Discussion

**Table No. 1: Common dental causes of medication**

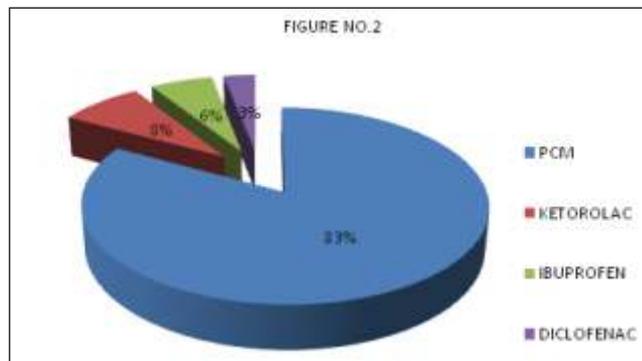
S.no.	Cause	No. Of students	%age
1.	Pain	24	92%
2.	Infection	2	8%
3.	Any other cause	nil	nil



From (tab 1, fig 1) it is found out that 92% of students prescribe medication for pain. However, 8% prescribe medication primarily for infection. This shows that the primary reason for the patients' visit to the dental OPD is pain.

**Table No. 2: Common NSAIDs prescribed**

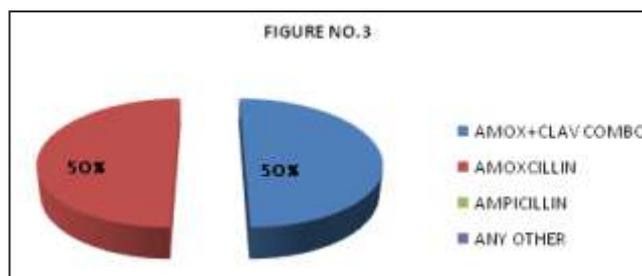
S.No	NSAIDs	No.of students	%age
1.	Diclofenac	1	3%
2.	Ibuprofen	2	6%
3.	Paracetamol	20	83%
4.	Ketorolac	3	8%
5.	Any other	nil	nil



As pain is the most common dental cause of medication, the NSAIDs used as an analgesics are paracetamol(PCM), followed by ketorolac, ibuprofen and diclofenac (tab 2, fig 2). As evident from tab.2 PCM is the most common analgesic prescribed by 83% of students of MRDC, as it is the safest analgesic. However, ketorolac is also prescribed to the patients by 8% of MRDC students as it takes care of acute and severe pain. However, ibuprofen and diclofenac are also prescribed by 6% and 3% of students respectively. This is in accordance with the study of Jain, Gupta et al (8).

**Table No. 3: Most common antibiotic prescribed**

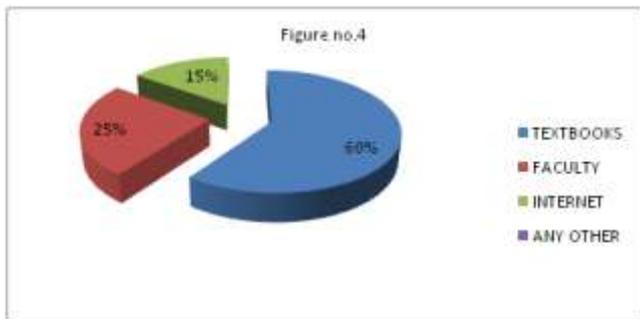
S.no.	Antibiotic	No.of students	%age
1.	Amoxicillin	13	50%
2.	Amoxicillin + Clavulanic acid	13	50%
3.	Ampicillin	0	0%
4.	Any other	nil	nil



The most common antibiotics prescribed are amoxicillin and amoxicillin + clavulanic acid combination that is 50% each, as seen in tab 3, fig 3.

Table No. 4: Sources of information regarding drugs and dosage

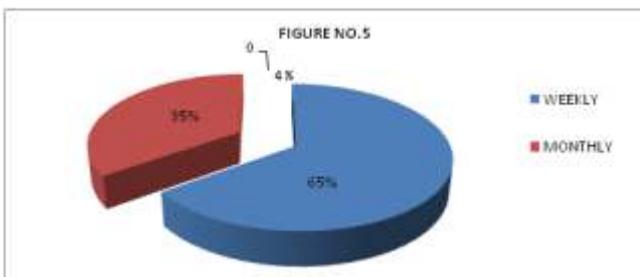
S. No.	Source of information	No. of students	%age
1.	Faculty	6	25%
2.	Textbooks	15	60%
3.	Internet	5	15%
4.	Any other	nil	nil



From tab 4, fig 4 it appears that 60% of information is gained from textbooks followed by 25% from faculty and 15% from the internet.

Table No. 5: Internet as source of information

S.no.	Usage of internet	No.of students	%age
1.	Weekly	17	65%
2.	Monthly	9	35%
3.	Yearly	nil	nil



Out of the 15% students who used internet as source of information (tab 4, fig 4), 65% use the internet as source of information on a weekly basis and 35% on monthly basis for knowledge (tab.5, fig.no. 5).

## Conclusion

The knowledge regarding drug prescription is important for good patient management and it is essential for the students to have proper knowledge of pharmacotherapeutics. As drug prescription as a dynamic process, the students should constantly update themselves.

From the pilot study it has been observed that most of the students prescribe amoxicillin and amoxicillin+clavulanic acid combination. The students need to know regarding the same, as they should be well updated with the knowledge about different antibiotics. Out of 15% of internet users for their knowledge updation, majority of the students use internet as source of information on a weekly basis, however, they should use it more frequently to strengthen their knowledge base. As observed from tab 4, fig 4; students refer to the textbooks as source of information regarding drugs and dosage, only 25% of students consult senior faculty for their knowledge regarding drugs, dose and duration. The students should consult the senior faculty more frequently, and also discuss regarding the drugs for better patient management.

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# TRANSMISSION, DIAGNOSIS AND POST EXPOSURE MANAGEMENT OF BLOOD BORNE VIRAL INFECTIONS IN DENTAL PROFESSIONALS

## Abstract

Healthcare-associated infection is an important public health problem worldwide. Healthcare providers are at risk of infection from blood-borne pathogens, including hepatitis B (HBV), human Immuno deficiency Virus (HIV) and hepatitis C virus (HCV). Hepatitis B infection is the major cause of acute and chronic liver disease, cirrhosis and hepatocellular carcinoma worldwide and has long been recognized as an occupational hazard among Medical, dental and other health care professionals. Doctors are more prone to get needle stick injury while giving i/v injection and during suturing process. HCV is transmitted primarily by contaminated blood, it represents a higher risk of nosocomial transmission to patients and healthcare workers. Chronic hepatitis C is the leading cause of chronic liver disease, cirrhosis, hepatocellular carcinoma (HCC) and liver transplants in India & other countries. HIV, Hepatitis B and Hepatitis C are three important fatal infections transmitted by needle stick injury. The transmission rate of Hepatitis B infection is nearly about 30% whereas transmission of HIV is only 0.3% and Hepatitis C only 1.8% and Hepatitis B being fatal can very well be prevented by proper vaccination and prophylaxis. The transmission of blood-borne viruses in dental clinics, hospitals & dental colleges is a potential hazard to patients and dental staff, particularly to oral and maxillofacial surgeons. In this article, we review the risk and management of the three blood-borne viruses most commonly involved in occupational transmission: human immuno deficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) and also discuss current methods of preventing exposure, including standard precautions and the use of safety devices in the health care setting, as well as recommendations for post exposure prophylaxis (PEP) & diagnostic techniques.

**Keywords:** hepatitis B virus (HBV), human Immuno deficiency Virus (HIV) and hepatitis C virus (HCV), hepatocellular carcinoma (HCC), post exposure prophylaxis (PEP)

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## Introduction

Today, blood borne viral infections have become a silent epidemic worldwide. In a dental office, infections can be expedited through several routes, including direct or indirect contact with blood, oral fluids, droplet splatter, aerosols, etc. The aim of the present review is to increase the awareness among dental practitioners, so as to reduce the burden of blood borne viral infections in their community. Exposure to blood-borne pathogens poses a serious risk to health care workers (HCWs). Transmission of at least 20 different pathogens by needle stick and sharps injuries has been reported (1). Despite improved methods of preventing exposure, occupational exposures continue to occur.

Assessment of the risk of blood-borne pathogen transmission in the health care setting requires information derived from various sources, including surveillance data, studies of the frequency and preventability of blood contacts, sero-prevalence studies among patients and HCWs, and prospective

studies that assess the risk of seroconversion after an exposure to infected blood. Factors influencing the risk to an individual HCW over a lifetime career include the number and types of blood contact experienced by the worker, the prevalence of blood-borne pathogen infection among patients treated by the worker, and the risk of transmission of infection after a single blood contact(2,4).

Dental health care professionals are said to be at a risk of infections caused by various microorganisms including *Mycobacterium tuberculosis*, hepatitis B and hepatitis C viruses (HBV and HCV, respectively), streptococci, staphylococci, herpes simplex virus type 1, HIV, mumps, influenza, and rubella.(3)HBV and HCV infections are the major causes of liver disease worldwide and the health policy makers with their strategies try to control these infections in the communities(4).

Dental surgeons have a great risk of exposure to hepatitis because of their numerous encounters

involving the use and disposal of sharp instruments. Every health care specialty that involves contact with mucosa, blood, or blood contaminated with body fluids should have the goal of ensuring compliance with standard precautions and other methods to minimize infection risks (1, 5, 6).

## **Transmission of Blood Borne Pathogens Among Dental Professionals**

### **Modes of Blood-Borne Pathogen Transmission**

In the health care setting, blood-borne pathogen transmission occurs predominantly by percutaneous or mucosal exposure of workers to the blood or body fluids of infected patients. Occupational exposures that may result in HIV, HBV, or HCV transmission include needle stick and other sharps injuries; direct inoculation of virus into cutaneous scratches, skin lesions, abrasions, or burns; and inoculation of virus onto mucosal surfaces of the eyes, nose, or mouth through accidental splashes. HIV, HBV, and HCV do not spontaneously penetrate intact skin, and airborne transmission of these viruses does not occur (7).

Hepatitis B is the major infectious occupational health hazard for the dentist. Epidemiological and serological evidence implicates saliva as the most probable vehicle for spreading HBV among contacts without apparent percutaneous exposures to blood products (4, 7).

Accordingly, attention has focused on the risks of infection by dental care, either as a result of patient-patient exposures by inadequately sterilized instruments or of dentist-patient exposures by intimate contacts with HBsAg carriers. An evaluation of the role of dental care in the spread of HBV infection in populations where high standards of dental care prevail is difficult because comparatively few individuals can be identified with past histories devoid of dental care. Furthermore, in the United States, for example, the chances that a dental patient will follow a potentially infective HBsAg carrier in the dentist's chair is on the order of 1 or 2 per 1,000, which is the prevalence of HBsAg carriers in healthy blood donor populations (7). Doctors are more prone to get needle stick injury while giving i/v injection and during surgical process. HIV, Hepatitis B and Hepatitis C are three important fatal infections transmitted by needle stick injury. The transmission rate of Hepatitis B infection is nearly about 30% whereas transmission of HIV is only 0.3% and Hepatitis C only 1.8% and Hepatitis B being fatal can very well be prevented by proper vaccination and prophylaxis. After infection with HBV, 10% of the patients develop chronic hepatitis and about 15%-25%

develop cirrhosis. Half of these individuals later develop hepatic decompensation or hepatocellular carcinoma(6, 7).

### **Risk of HIV Infection Post exposure**

Prospective studies of HCWs have estimated that the average risk for HIV transmission after a percutaneous exposure to HIV-infected blood is approximately 0.3% (95% confidence interval = 0.2 to 0.5%) (6) and that after a mucous membrane exposure it is 0.09% (95% confidence interval = 0.006 to 0.5%) (1,7). The risk after a cutaneous exposure is less but has not been well quantified since no HCW enrolled in a prospective study has seroconverted after an isolated skin exposure. There are insufficient data to quantify the risk of transmission after occupational exposure to potentially infectious tissues or fluids other than blood. However, in a study by Fahey et al., none of 559 participants reporting cutaneous exposures to blood, sputum, urine, faeces, or other body substances from patients presumed infected with HIV acquired HIV infection (1,7). There is also no evidence of a risk for HIV transmission by the aerosol route.

### **Incidence of Occupationally Acquired HIV Infection**

As of 30 June 1999, a total of 191 U.S. workers had been reported to the CDC's national surveillance system for occupationally acquired HIV infection (Table 1)(8). Fifty-five HCWs had known occupational HIV exposures, with a baseline negative HIV test and subsequent documented seroconversion. Fifty of these exposures were to HIV-infected blood, one was to visibly bloody fluid, one was to an unspecified fluid, and three were to concentrated virus in a laboratory. Of the 55 HCWs, 47 sustained percutaneous exposures, 5 had mucocutaneous exposures, 2 had both a percutaneous and a mucocutaneous exposure, and 1 had an unknown route of exposure. Twenty-five of these HCWs have developed AIDS.

**Table 1. HCWs with documented and possible occupationally acquired HIV infection reported through June 1999 in the United States.**

Occupation	No. of documented cases of occupational transmission	No. of possible cases of occupational transmission
Dental worker, including dentist		6
Embalmer or morgue technician	1	2
Emergency medical technician or paramedic		12
Health aide or attendant	1	15
Laboratory technician, clinical	16	16
Nurse	23	34
Technician, surgical	2	2
Technician or therapist, other		10

### Risk of HBV Infection Postexposure

The probability of HBV transmission after an occupational exposure is dependent upon the concentration of infectious virions in the implicated body fluid, the volume of infective material transferred, and the route of inoculation (e.g., percutaneous or mucosal).

HBV is present in high titres in blood and serous fluids, ranging from a few virions to  $10^9$  virions per ml (9). The virus is present in moderate titres in saliva, semen, and vaginal secretions. The titre in semen and saliva is generally 1,000 to 10,000 times lower than the corresponding titre in serum. Other body fluids such as urine and faeces contain very low levels of HBV unless contaminated with blood (10, 11, 12).

One of the most common modes of HBV transmission in the health care setting is an unintentional injury of an HCW from a needle contaminated with HBsAg-positive blood from an infected patient (13). The average volume of blood inoculated during a needlestick injury with a 22-gauge needle is approximately 1  $\mu$ l (V. M. Napoli and J. E. McGowan, Letter, J. Infect. Dis. 155:828, 1987), a quantity sufficient to contain up to 100 infectious doses of HBV (15). The risk of transmission after a needlestick exposure to a nonimmune person is at least 30% if the source patient is HBeAg positive but is less than 6% if the patient is HBeAg negative (Table 2).

**Table 2. Average Risk of Seroconversion Following a percutaneous exposure to an infected source.**

Virus	Risk of conversion
Hepatitis B* (HbsAg - positive)	HbeAg-negative:5% HbeAg: 19% - 30%
Hepatitis C +	1.8%
Hiv*	0.31%

\*Data from Lanphear, Epidemiol Rev 1994; 16;437-50 + Data from CDC, MMWR Morb Mortal Wkly Rep 1998;47(RR-19)

### Risk of HCV Infection Postexposure

HCV is transmitted efficiently by large exposures to blood such as through transfusion of blood or blood products from infectious donors. Overt percutaneous exposures to HCV (e.g., accidental needle stick injuries) also have been documented as means of HCV transmission.

The risk that an HCV-infected individual will transmit the virus may be related to the type and size of the inoculum and the route of transmission as well as the titer of virus, but data on the threshold concentration of virus needed to transmit infection are insufficient. Neither the presence of antibody nor the presence of HCV RNA is a direct measure of infectivity (13).

Prior to the discovery of HCV, a significant association was noted between acquiring acute non-A, non-B (NANB) hepatitis and employment in patient care and laboratory work (15, 16). A case-control study among British blood donors found that having been an HCW was a risk factor for having HCV infection (15). A number of case reports have documented occupational HCV transmission from anti-HCV-positive patients to HCWs in a variety of settings (15, 16). A history of accidental needle stick exposures among HCWs has also been recorded.

### Detection & Diagnostic methods

#### Detection and Diagnosis of HIV Infection

After initial primary infection with HIV, there is a window period prior to the development of detectable antibody. In persons with known exposure dates, the estimated median time from initial infection to the development of detectable antibody is 2.4 months; 95% of individuals develop antibodies within 6 months of infection (17). Among HCWs with a documented

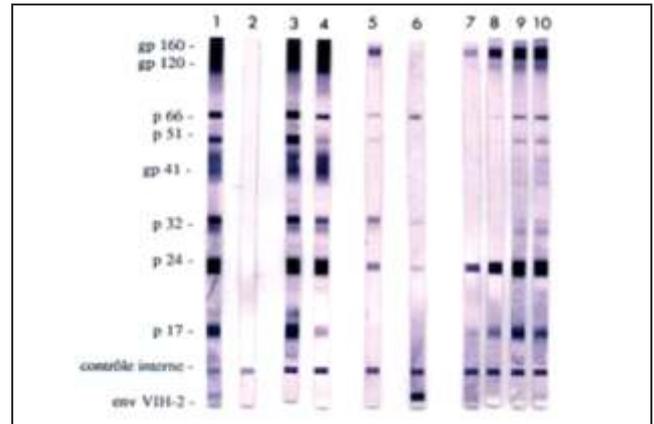
seroconversion to HIV, 5% tested negative for HIV antibodies at >6 months after their occupational exposure but were seropositive within 12 months (18). The two antibody tests commonly used to detect HIV are the enzyme immunoassay (EIA) (FIG- 1) and the Western blot. An HIV test result is reported as negative when the EIA result is negative. The result is reported as positive when the EIA result is repeatedly reactive and when the result of a more specific, supplemental confirmatory test, such as the Western blot, is also positive (FIG 2). Once an individual develops an antibody response, it usually remains detectable for life. HIV infection for longer than 6 months without detectable antibody is uncommon (17, 18).

Direct virus assays (e.g., PCR for HIV RNA) are sensitive methods for the detection of HIV infection. However, problems with laboratory contamination, false-positive rates, and increased costs limit their routine use. While PCR for HIV RNA is approved for use in established HIV infection, its reliability in detecting very early infection has not been determined. At present, the false-positive and false-negative rates of PCR are too high to warrant a broader role for it in routine postexposure management (19).

**Fig. 1 Typical ELISA Test results- Orange shows positivity**



**Fig. 2 Typical test results of Western Blot For HIV- dark bands show positivity for different Ags**



### Detection and Diagnosis of HBV Infection

The incubation period for acute hepatitis B ranges from 45 to 160 days, with an average of 120 days. Exposure to HBV can lead to an acute infection which may result in a chronic infection. Acute hepatitis B resembles other forms of viral hepatitis and cannot be distinguished based on history, physical examination, or serum biochemical tests.

The diagnosis of acute HBV infection is confirmed by the demonstration in serum of hepatitis B surface antigen (HBsAg), which appears well before onset of symptoms and before development of antibody to hepatitis B core antigen (anti-HBc), and immunoglobulin M (IgM) antibody to HBc, which appear at approximately the same time as symptoms (19). The presence of IgM anti-HBc indicates recent HBV infection, usually within the preceding 4 to 6 months. The presence of hepatitis B e antigen (HBeAg) in serum correlates with HBV replication, high titers of HBV, and infectivity. Persons who are positive for HBeAg typically have  $10^8$  to  $10^9$  HBV particles per ml of blood (19). In persons who resolve acute HBV infection, antibody to HBsAg (anti-HBs) develops and indicates immunity. The persistence of HBsAg for 6 months after the diagnosis of acute HBV is indicative of progression to chronic HBV infection.

HBV serologic markers in different stages of infection and convalescence are summarized in Table 3. Anti-HBc indicates prior infection and lasts indefinitely. In persons who respond to the hepatitis B vaccine, anti-HBs is the only antibody that is elicited. Persons with chronic infection who have mutations in the precore region of the HBV genome that prevent the expression of HBeAg but allow the expression of infectious virus have been described (20). High titres of HBsAg can be observed in these persons even though they are HBeAg negative.

**Table 3. HBV serologic markers in different stages of infection and convalescence (20)**

Stage of infection	HBsAg	Anti-HBs	Anti-HBc		HBeAg	Anti-HBe
			Total <sup>b</sup>	IgM		
Late incubation period	+	-	-	-	+ or -	-
Acute hepatitis B	+	-	+	+++	+	-
HBsAg carrier	+	-(+ rarely)	+	-	+ or -	+ or -
Recent (<6 months; resolved infection <sup>c</sup> )	-	++	++	+	-	+ or -
Distant (>6 months; resolved infection <sup>c</sup> )	-	++	++	-	-	+ or -
Vaccinated	-	++	-	-	-	-

<sup>a</sup>+, positive; ++, strongly positive; +++, very strongly positive; + or -, variable reaction; -, negative.

<sup>b</sup>The total anti-HBc assay detects both IgM and IgG antibody.

<sup>c</sup>Resolved, the patient no longer has the disease.

### Detection and Diagnosis of HCV Infection

The incubation period for acute HCV infection ranges from 2 to 24 weeks, with an average of 6 to 7 weeks (20). Because different types of viral hepatitis are indistinguishable based on clinical symptoms alone, serologic testing (Table 30) is necessary to establish a specific diagnosis of hepatitis C (20). Screening EIA and supplemental immunoblot assays are licensed and commercially available to detect antibodies to HCV (anti-HCV) (20). Because the rate of false positivity for the screening EIA is high in many populations, including HCWs, supplemental immunoblot assays must be used to judge the validity of repeatedly reactive EIA results. Anti-HCV may be detected within 5 to 6 weeks after the onset of infection and remains detectable long after the primary infection. In general, the interpretation of serologic tests for anti-HCV is limited by the following factors: (i) assays for anti-HCV do not distinguish between acute, chronic, or past infection; (ii) in acute infection there may be a prolonged interval between onset of illness and anti-HCV seroconversion (though most infected individuals seroconvert within 3 months of exposure); and (iii) the

detection of anti-HCV does not necessarily indicate active HCV replication (20,21).

### Tests for HCV infection

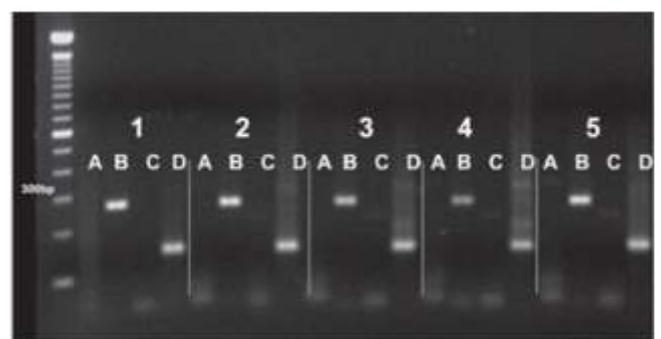
HCV RNA can be detected in serum or plasma within 1 to 2 weeks of exposure to the virus and several weeks before onset of alanine aminotransferase (ALT) elevations or the appearance of anti-HCV (15). In patients with chronic HCV infection, HCV RNA levels may remain relatively stable or can fluctuate over 1,000,000-fold. Fluctuations in HCV RNA may or may not correlate with elevations in transaminase levels. Rarely, the detection of HCV RNA may be the only evidence of HCV infection (20, 21).

PCR techniques to amplify reverse-transcribed cDNA are currently the most sensitive methods for detecting HCV RNA. Both qualitative and quantitative (22) methods can be used to detect HCV RNA. Quantitative assays are less sensitive than qualitative assays and should not be used as a primary test to confirm or exclude the diagnosis of HCV infection (23). Currently, testing for HCV RNA is available on a research basis and no tests have been approved by the U.S. Food and Drug Administration. Because of assay variability, results of HCV RNA testing should be interpreted cautiously (Fig. 3).

**Fig 3. Typical test results of HCV- RNA PCR assay-band shows positivity.**

### Preventive measures

### Prevention and Management of Blood Borne



A - HCl11/18<sup>1</sup>, B - SM31HC18 (this study), C - P32/P36 and D - P33/P48<sup>2</sup>. The product of C was used as a first-round product for D set ("nested"-PCR). 1-5 are HCV-RNA positive samples quantified by the Roche HCV-Monitor method and diluted to 500 copies mL<sup>-1</sup>. Primer pair B shows sensitivity similar to the nested products (D).

**Fig. 3 - Comparison of amplification efficiency of four different 5'UTR primer pairs for HCV-RNA RT-PCR.**

## infections in Dental clinic

To decrease the burden of hepatitis in dental health care workers, it is recommended that the dental professionals should receive immunization against hepatitis virus and should use individual protective equipment's such as gloves, head caps, masks, etc (18,19).

Despite the availability and recommendations on hepatitis B vaccination, the vaccination rate among dental professionals has remained consistently low in developing countries. A study reported that only 20% of dental surgeons had received three doses of hepatitis B vaccine in Benin City, Nigeria (20). In another study among Brazilian dentists, 73.8% of dentists were reported to have three doses of hepatitis B vaccine.(4,20) It has been found that 5–10% of normal subjects do not produce the anti-hepatitis B surface antibody (anti-HBs) after receiving a standard course of HBV vaccine. Thus, a post-vaccination testing, 1–3 months following the third dose of vaccine, is recommended for health care workers who have contact with blood(4,22).

Each dental health care facility should develop a comprehensive written program for preventing and managing occupational exposures. This should focus on the following:

- Dental health care provider should receive three doses of hepatitis B vaccination.
- Describe the type of blood exposures that may place dental health care personnel (DHCP) at risk of infection.
- Outline the procedures for promptly reporting and evaluating such exposures.
- Identify the health care professional who is qualified to provide counselling and perform all medical evaluations and procedures in accordance with the most current US Public Health Care Service (CDC) recommendations.

### Exposure that might place a dentist at risk of blood borne infection includes the following

- Percutaneous injuries (needlestick or cut with a sharp object)
- Contact with potentially infectious blood, tissues, or other body fluids
- Mucus membranes of the eye, nose, or mouth or non-intact skin (exposed skin that is chapped, abraded, or afflicted with dermatitis).

Percutaneous injuries pose a greater risk of transmission. The majority of exposures in dentistry

are preventable, and methods to reduce the risk of blood contacts have included use of standard precautions and engineering controls and modifications of work practice. These approaches might have contributed to the decrease in percutaneous injuries among dentists during recent years. However, needlesticks and other blood contacts continue to occur, which is a concern because percutaneous injuries pose the greatest risk of transmission.

When a patient enters a dental clinic, his/her medical history should be recorded. All patients with a history of hepatitis must be managed as they are potentially infectious. Whether or not an individual becomes a chronic carrier of hepatitis B depends on geographic, socioeconomic, immunologic, and genetic factors. A high carrier rate is found among patients with the following (6)

- Lepromatous leprosy
- Lymphoma
- Patients on chronic renal dialysis
- Down syndrome
- Patients receiving immunosuppressive drugs
- Drug abusers having history of hepatitis.

### The following are the guidelines for treating hepatitis patients

- No dental treatment other than urgent care should be rendered for a patient with acute viral hepatitis(2)
- Hepatitis B is of primary concern to the dentist. Individuals still carry the virus up to 3 months after the symptoms have disappeared, so any patient with a recent history of hepatitis B should be treated for dental emergency problems only(6)
- For patient with a past history of hepatitis, consult the physician to determine the type of hepatitis, course and length of the disease, mode of transmission, and any chronic liver disease or viral carrier state
- For recovered HAV or HEV, perform routine periodontal care
- For recovered HBV and HDV, consult with the physician and order HBsAg and HBs laboratory tests.
- If HBsAg and anti-HBs tests are negative but HBV is suspected, order another Hbs determination.
- Patients who are HBsAg positive are probably infective (chronic carriers); the degree of



infectivity is measured by an HBsAg determination.

- Patients who are anti-HBs positive may be treated routinely.
- Patients who are HBsAg negative may be treated routinely.

**If a patient with active hepatitis, positive-HBsAg (HBV carrier) status, or positive HCV status requires emergency treatment, use the following precautions**

- Consult the patient's physician regarding status
- If bleeding is likely during or after treatment, measure prothrombin time (PT) and bleeding time. Hepatitis may alter coagulation; change treatment accordingly
- All personnel in clinical contact with the patient should use full barrier technique, including masks, gloves, glasses or eye shields, and disposable gowns
- Use as many disposable covers as possible, covering light handles, drawer handles, and bracket trays. Headrest covers should also be used
- All disposable items (e.g., gauze, floss, saliva ejectors, masks, gowns, gloves) should be placed in a lined wastebasket. After treatment, these items and all disposable covers should be bagged, labelled, and disposed of, following proper guidelines for bio-hazardous waste
- Aseptic techniques should be followed at all times. Minimize aerosol production by not using ultrasonic instrumentation, air syringe, or high-speed hand pieces. Remember that saliva contains a distillate of the virus. Pre-rinsing with chlorhexidine gluconate for 30 s is highly recommended
- When the procedure is complete, all equipment's should be scrubbed and sterilized. If an item cannot be sterilized or disposed of, it should not be used
- All working surfaces and environmental surfaces should be wiped with 2% activated glutaraldehyde (Cidex).

**Work practice controls are an important adjunct for preventing blood exposures. They are as follows: [1]**

- Using a one-handed scoop technique, a mechanical device designed for holding the needle cap to facilitate one-handed recapping, or

an engineered sharp injury protection device (e.g., needles with re-sheathing mechanisms) for recapping needles between uses and before disposal

- Not bending or breaking needles before disposal
- Avoid passing a syringe with an unsheathed needle
- Removing burs before disassembling the hand piece from the dental unit
- Using instruments rather than fingers to grasp needles, retract tissue, and load/unload needles and scalpels
- Placing used disposable syringes and needles, scalpel blades, and other sharp items in appropriate puncture-resistant containers located as close as feasible to where the items were used
- Giving verbal announcements when passing sharps.

These recommendations stress that blood is the most important source of HIV, HBV, and other blood-borne pathogens and that infection control efforts should focus on the prevention of exposures to blood as well as the receipt of HBV immunizations. In 1987 the CDC developed universal precautions to help protect both HCWs and patients.

In 1995, the CDC's Hospital Infection Control Practices Advisory Committee (HICPAC) introduced the concept of standard precautions, which synthesizes the major features of universal precautions and body substance isolation into a single set of precautions to be used for the care of all patients in hospitals regardless of their presumed infection status (26). Blood, certain other body fluids (e.g., semen, vaginal secretions, and amniotic, cerebrospinal, pericardial, peritoneal, and synovial fluids), and tissues of all patients should be considered potentially infectious (25). Standard precautions apply to blood; all body fluids, secretions, and excretions (except sweat); nonintact skin; and mucous membranes (21). The core elements of standard precautions comprise (i) hand washing after patient contact, (ii) the use of barrier precautions (e.g., gloves, gowns, and facial protection) to prevent mucocutaneous contact, and (iii) minimal manual manipulation of sharp instruments and devices and disposal of these items in puncture-resistant containers (25,26,27).

The CDC's recommendations—along with the blood-borne pathogen standard issued by the Occupational Safety and Health Administration (OSHA), which

requires that HBV vaccine be made available to HCWs with risk of occupational exposure(28).

## Conclusion

Merely celebrating World AIDS day or Hepatitis Day on is not sufficient for increasing awareness in the community. It is an opportunity for the people and health policy makers globally for more knowledge sharing and finding better approaches for control of HBV and HCV infections in their communities. The role of media in collaboration with expert in the field of blood borne viral infections, general and dental surgeons, and infectious centre's for generation of massive public informative and educational materials is very critical.

The role that a dentist can play in prevention of blood-borne viral infections is by considering each and every patient as a potential carrier of such infections. Proper infection control and sterilization protocols should be followed in order to reduce the risk of infection.

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## Abstract

There are a wide variety of techniques, prescriptions and materials that can be used to correct malocclusions. Esthetic appliances have gained popularity in recent years and there seems to be a continual search for new materials that can provide similar orthodontic results without compromising esthetics. This article will describe the relevant aspects of The Invisalign® system, this system is a sequence of clear aligners that are worn sequentially to gradually correct misaligned teeth.

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## Introduction

The public perception of quality of life has changed over the past few decades. Quality of life in modern times has taken on a new form: one emphasizing beauty and youth more than ever before. This emphasis on facial and dental esthetics has motivated adults to seek orthodontic treatment and with the development of new esthetic appliances, such as Invisalign®, adult patients are able to experience an esthetic appearance without compromising on the treatment process.

Orthodontic appliances conveniently fall into four categories: removable, fixed, functional, and extra-oral. Removable appliances have received much criticism in the past, Richmond and Shaw demonstrated that fifty percent of cases treated with removable appliances had either not improved or actually worsened. It has thus been highly recommended that removable appliances be only considered in tipping, block movements, overbite reduction, space maintenance, and retention. Fixed appliances tend to be the appliance of choice for most orthodontists, because it is believed that teeth may be more fully controlled in three dimensions of space.

Multiple teeth may be translated simultaneously and a more precise treatment outcome may be established. Functional appliances are a modality of orthodontic treatment surrounded by controversy, due to disagreeing views on the exact physiologic mechanism of action. While these appliances may allow for considerable tooth movement, precision in tooth placement, rotation correction, and effective bodily tooth translation may not be possible.

The first report of an elastic and removable tooth positioning appliance, built from an individualized setup of plaster cast models, dates back to 1945.<sup>13</sup> Since then, several different types of removable appliances have been developed. Among these appliances are the clear retainer<sup>14</sup> and the Essix appliance,<sup>15</sup> which have been associated with inter proximal reduction. These appliances are considered to be tedious since periodic impressions and setups are required in order to produce new aligners.

The Invisalign® system (Align Technology, Inc, Santa Clara, California, USA) was introduced in 1997 using software technology developed for treatment diagnosis and simulation. The Invisalign® system quickly gained popularity as one of the most esthetic options for tooth movement. The system is a sequence of clear aligners that are worn sequentially to gradually correct misaligned teeth. Invisalign® combines CAD-CAM (computer-aided design and manufacturing) technology and uses 3-D images of the patient's teeth which have been obtained from an addition silicone impression. Treatment is virtually simulated and the aligners required for treatment are personalized and manufactured in a series, at the same time.<sup>15, 16</sup> Invisalign® is currently the most popular among serial aligner treatment, which is most likely due to its accuracy and the ability to manufacture all aligners at once from a single mold.<sup>15, 16</sup>

Accurate impressions are taken to allow the construction of precision casts which can be scanned to produce a virtual 3D model. This 3-D model can then

be manipulated by the orthodontist and malocclusion is virtually corrected using proprietary software. This information can then be used to produce a series of clear plastic aligners that gradually correct the malocclusion. Such aligner is worn for approximately 20 hours per day and is changed approximately every two weeks. Each aligner will move the teeth around 0.25 to 0.3 mm.<sup>1,2</sup>



### Indications For Invisalign Appliances<sup>3</sup>

- Mild crowded and mal aligned problems (1-5 mm)
- Spacing problems (1-5 mm)
- Deep overbite (Class II div 2 cases)
- Narrow arches that can be expanded without tipping the teeth too much.
- Absolute intrusion (1 or 2 teeth).
- Lower incisor extraction for severe crowding cases.
- Tip molar distally.

### Advantages<sup>4,5</sup>

- The trays are clear, aesthetic, and comfortable.
- Less discomfort, mucosal irritation, and soreness of the teeth.
- Invisalign may also be a great option for patients who have para functional habits such as bruxism and grinding.
- Patients who have short roots may also be good candidates for clear aligners.
- No Reported Root Resorption.
- Clear aligners have also proven useful in correcting a mild anterior open bite.
- The intrusive effect on posterior teeth due to increased interocclusal distance from the double thickness appliance material can help to close a dental open-bite<sup>9</sup>.
- Similarly, correction of a deep overbite is a major advantage with the Invisalign appliance, because there is more predictability with intrusion mechanics and disocclusion of teeth<sup>10,11</sup>
- Better oral hygiene than fixed. Unlike traditional braces, the trays can be removed for brushing, flossing, and eating.

Shorter dental appointments.

Retention facilitated.

Ideal for retreatment.

Decreased occlusal abrasion from para functional habits during treatment.

Disarticulation of the teeth may be advantageous for patients with TMJ problems.

Technically much easier than lingual appliances.

Approximating the treatment duration a little more precisely than braces.

Avoiding extractions of premolars by creating interdental space via interproximal reduction.

Less frequent trips to the dentist by allowing the patients to replace their aligners on their own every few weeks.

Healthier periodontal tissue and less risk of enamel decalcification by avoiding brackets.

### Disadvantages

The aligners are removable; hence the orthodontist must rely on the patients motivation and dependability to achieve the desired results.

All permanent teeth should be fully erupted for using this appliance, as it is difficult to achieve retention of the appliance on short clinical crowns.

Unlike fixed or other types of removable appliances, the treatment plan cannot be changed once the appliance series has begun.

Another disadvantage to the appliance is the limitation with extraction cases. Premolar extraction treatment is difficult to manage with the appliance, because it is difficult to maintain the roots and teeth in an upright manner. Bollen found that excessive tipping occurs around premolar extraction sites and that only 29% of patients with two or more premolar extractions had complete space closure with the aligners<sup>12</sup>. Other disadvantages to the appliance are the limitations in correcting buccal malocclusions.

These devices must be worn 22 hours a day, these must be removed during meals, when drinking hot drinks that could spot or cause deformation, sugary drinks and during the oral hygiene at home.<sup>6</sup>

### Invisalign®

The Invisalign® system is produced by Align Technology Inc. (Santa Clara, CA, USA) and is based on 3-D technology using CAD-CAM. The “aligner” is made of polyurethane and can be used to correct

various types of malocclusions. Only accredited clinicians can use this system. Once accredited, the practitioner selects the case to be treated, makes the diagnosis, treatment plans and sends to Align Technology a polyvinylsiloxane, a bite registration in maximum intercuspation, a panoramic radiograph, alateral cephalometric radiograph, and extra- and intra-oral photographs.<sup>18-20</sup>

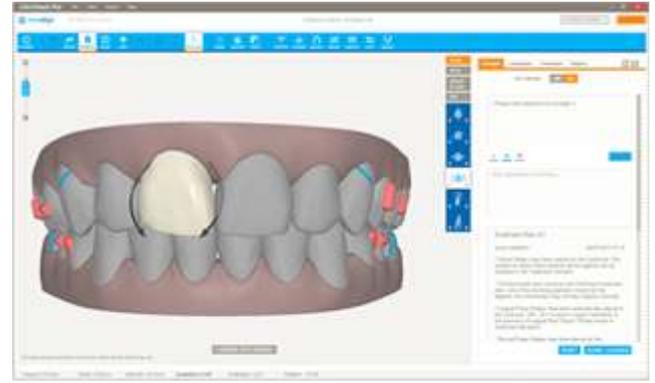
The impressions are scanned (destructive scanning) and a 3-D version of the patient's dental arches and occlusion are created in the computer, so corrections can be made virtually, using CAD (Computer-Aided Design). The virtual file (ClinCheck) is sent for verification by the practitioner, who may require changes before approving the step-by-step protocol developed for treatment.

Once the ClinCheck is approved, the CAM (Computer-Aided Manufacturing) phase using stereolithography begins, in order to produce the models for manufacturing the patient's aligners.

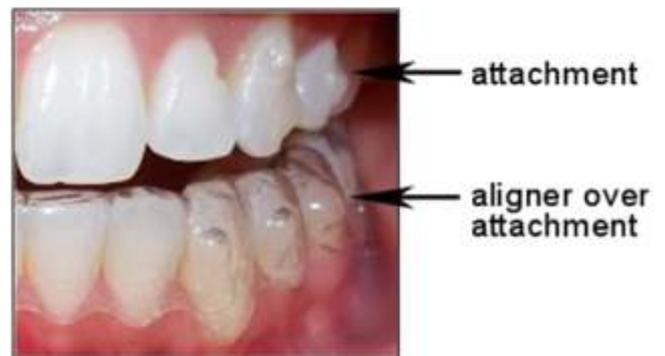


The company guarantees slowtooth movement (linear movement: 0.25mm/month; angular movement: 2°/month) without occlusal or interproximal interference.<sup>21</sup> Therefore, the number of aligners for each case depends on the complexity of necessary movements, resulting in variable treatment costs. The practitioner receives all aligners approximately 45 days after approving the ClinCheck.

It is important to remind the patient that it is not possible to interrupt treatment and use the same aligners at a later time.<sup>22</sup>



Replacing the aligners every two weeks is the most efficient form of treatment and causes less sensitivity when aligners are changed.<sup>12,23</sup> The aligners should be removed only during meals and for oral hygiene, and should be worn at least 20 hours a day.<sup>21</sup> Aligners should be cleaned using a toothbrush and toothpaste. For post-treatment retention, the last aligner may be worn in the upper arch, with a 3x3 retainer in the lower arch.



### Conclusion

Invisalign offers patients a wide variety of advantages. Not only is invisalign the most esthetically pleasing appliance available today, but it also can make orthodontic treatment more comfortable and convenient but clinicians must rely on scientific evidence as well as their clinical experience in order to make appropriate decisions regarding treatment with the Invisalign appliance.

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# EFFECT OF PERIODONTAL TREATMENT ON GLYCEMIC CONTROL IN DIABETIC PATIENTS

## Abstract

Periodontal disease and diabetes mellitus share common pathogenic pathways involving the cytokine network resulting in increased susceptibility to both diseases, leading to increased inflammatory destruction, insulin resistance, and poor glycemic control. Periodontal treatment may improve glycemic control.

**Keywords :** Periodontal treatment, glycemic control, diabetic patients

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## Introduction

Diabetes was diagnosed in approximately 1550BC. Gruner first reported the association between diabetes and periodontal disease. Periodontitis is considered as the sixth complication of diabetes mellitus. Recent studies have presented evidence indicative of a bidirectional adverse interrelationship between both type 1 and type 2 diabetes mellitus and periodontal diseases.

There is a growing body of evidence supporting the fact that periodontal infection with gram-negative microorganisms adversely affects glycemic control. Type 2 diabetes mellitus is a highly prevalent metabolic disease that causes an impairment in glycemic control. Such impairment can cause a decrease of polymorphonuclear leukocytes activity and damage to microvascular endothelium, either of which can increase the susceptibility to periodontal disease.

The presence of a chronic infection, such as periodontitis, might induce an increase of circulating cytokines and soluble factors (such as C-reactive protein [CRP], interleukin.1 $\beta$  [IL.1 $\beta$ ], interleukin.6 [IL.6], tumor necrosis factor. $\alpha$  [TNF. $\alpha$ ] and prostaglandin.E<sub>2</sub> [PGE<sub>2</sub>]), which in turn increases the general inflammatory burden in the host. These events, as a result of low-grade chronic infection might alter the insulin activity, impairing glycemic control. Furthermore, recent epidemiological studies have correlated the presence of periodontal diseases to poor glycemic control in patients with diabetes.

Epidemiological studies conducted in the U.S. (NHANES III) reported that adults with poorly controlled diabetes had a 2.9-fold increased risk of having periodontitis compared to non-diabetic subjects.

Each 1% reduction in the haemoglobin A1c (HbA1c) in the United Kingdom Prospective Diabetes Study (UKPDS) was associated with a relative risk reduction of 21% for any diabetes-related endpoint, 21% for diabetes-related deaths, 14% for myocardial infarction and 37% for microvascular complications.

The periodontal treatment of diabetic patients depends on glycemic control. In general, patients with well-controlled type 1 or type 2 diabetes may have no more significant risk of experiencing oral disease progression than those without diabetes and hence, can be treated similarly. The response to therapy may not be as favourable in patients with poor glycemic control (Hb A1C >10%) as it is in those with better control (Hb A1c <8%).

## GLYCOSYLATED HEMOGLOBIN

### "Hb" stands for haemoglobin

four subgroups of hemoglobin: HbA0, HbA1, HbA2 and HbF.

HbA1c, is a form of haemoglobin that is bound to glucose.

Glycohemoglobin is formed continuously in erythrocytes as a product of the non-enzymatic reaction between the hemoglobin protein, which carries oxygen molecules, and glucose. Binding of glucose to hemoglobin is highly stable; thus, hemoglobin remains glycosylated for the life span of the erythrocyte, approximately 123  $\pm$  23 days. Determination of glycohemoglobin levels provides an estimate of the average blood glucose level over time, with higher average blood glucose levels reflected in higher hemoglobin A1c values as shown in Table 1 (Rohlfing

CL et al 2002) and accurately reflects the mean blood glucose concentration over the preceding 1–3 months.

**Table 1: Correlation between Haemoglobin A1C (Hb A1C) levels and mean plasma glucose levels<sup>1</sup>.**

Hb A1C (%)	Mean plasma glucosemg/dl	Mean plasma glucosemmol/l
6	135	7.5
7	170	9.5
8	205	11.5
9	240	13.5
10	275	15.5
11	310	17.5
12	345	19.5

**A1, Glycosylated Hemoglobin (A1C) Test**

This blood test indicates the average blood sugar level for past two to three months. It measures the percentage of glucose molecules attached to hemoglobin in the blood (Table 2)<sup>1</sup>.

**Table 2 :**

A1C Level	Inference
> 6.5 %	Diabetes
- 5.7% - 6.4 %	Pre - Diabetes
- Below 5.7 %	Normal

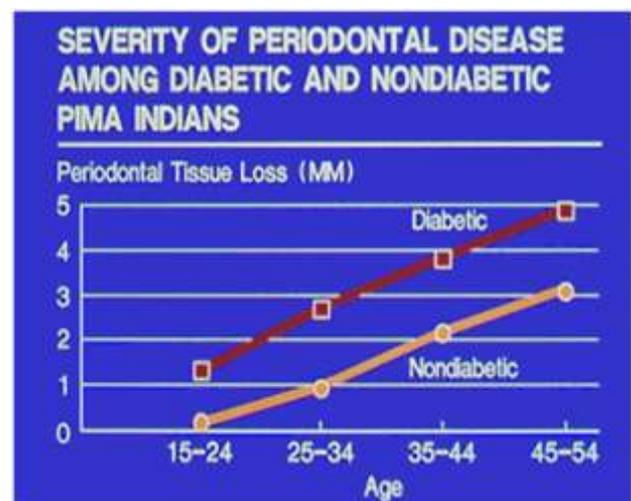
- It is generally recommended that the haemoglobin A1c test be performed at least twice a year in patients who are meeting treatment goals, and every 3 months in patients whose therapy has changed or who are not meeting their glycemic goals.

**Association between periodontitis and diabetes mellitus**

There is a general agreement that Diabetes mellitus is a risk factor for periodontitis.

- The prevalence and severity of periodontitis has been found to be significantly higher in diabetic patients compared to non-diabetic patients (Ship Jonathan A. 2003, Khder YS et al. 2006)<sup>2,3</sup>. Glycemic control is considered as the risk factor for the development of periodontitis in diabetic patients. According to a study by Shlossman et al.1990 in Pima Indians population, had higher prevalence and severity of periodontitis compared to non-diabetics of the same population. It was concluded that Poorly controlled diabetics had a three fold increase in risk of having periodontitis as compared to non-diabetics<sup>4</sup> (Figure 1).

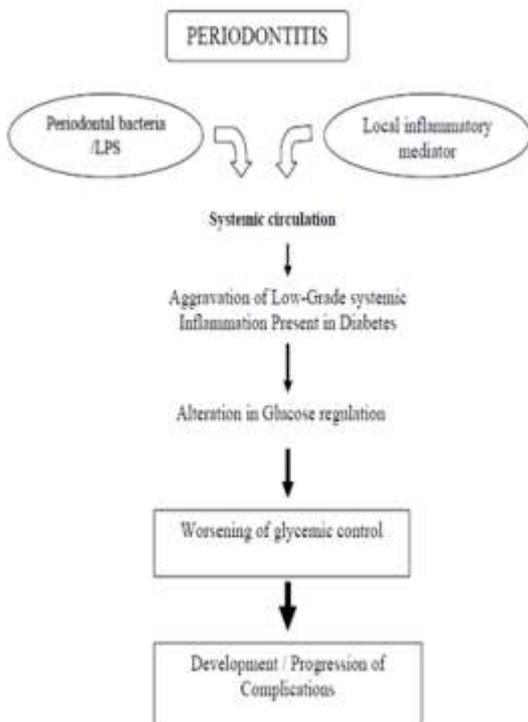
**Figure 1 : The severity of periodontal disease among diabetic and nondiabetic Pima Indians<sup>4</sup>.**



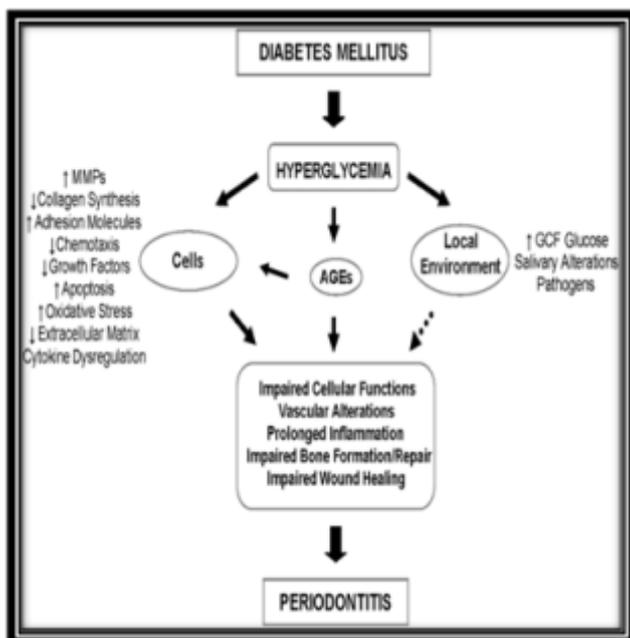
- In contrast another study proved that the patient with most advanced periodontitis at baseline demonstrated an approximately five-fold greater increase in HbA1c over the 5 years of the study compared with those with no periodontitis at baseline<sup>5</sup> (Demmer RT et al 2010).
- Mechanisms explaining the influence of periodontitis on the diabetic status (Figure 2)

and mechanism which increased the susceptibility to periodontitis in diabetic (Figure 3) are explained below.

**Figure 2 : Potential mechanisms for the influence of periodontitis on the diabetic status<sup>6</sup>.**



**Figure 3 : Mechanisms explaining the increased susceptibility to periodontitis in diabetic patients<sup>7</sup>**

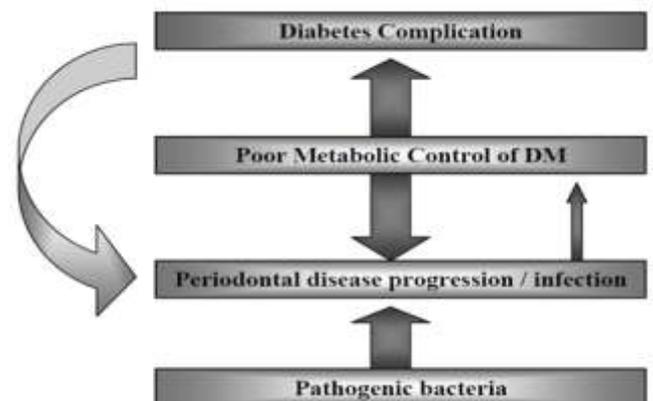


## Effect of diabetes on periodontal disease progression

A Study by Demmer RT in 2008 suggested that Type 1 diabetic patients with advanced complications had significantly more bleeding on probing, pockets  $\geq 4$  mm deep, and had more attachment loss than patients without complications<sup>8</sup>. Periodontal destruction can start very early in life in diabetic children and becomes more prominent as children become adolescents<sup>9</sup>. Type 2 DM may also increase the risk of alveolar bone destruction over time. In a two-year longitudinal study, it was reported that there was a fourfold increased risk of progressive alveolar bone loss in adults with type 2 diabetics compared with non-diabetics<sup>10</sup>.

Taylor GM et al.1998 suggested the Adverse effect of poor metabolic control of diabetes on periodontal disease progression and diabetes complication as shown in figure 4.

**Figure 4 : Poor Diabetes control and periodontal disease progression<sup>11</sup>**



## Effect of periodontal treatment on glycemic control

Though, it is difficult to quantify the clinical relevance of such findings in terms of improved glycemic control. The meta-analysis showed that periodontal treatment significantly reduces the levels of HbA1c<sup>12</sup> and an improvement of glycemic control in diabetic patients<sup>14,15</sup> (Teuw WJ et al in 2010, Corbella S et al in 2013). Conversely, other studies did not support the use of nonsurgical periodontal treatment in patients with diabetes for the purpose of lowering levels of HbA1c<sup>16</sup> (Engebretson SP et al, 2014). A Study by Costa K et al 2017 suggested that identification of the risk factors for periodontal disease and periodontal treatment might improve glycemic control of patients with Type 2 DM by eliminating periodontal infection<sup>17</sup>, despite an improvement in clinical periodontal parameters in

patients with type 1 diabetes mellitus<sup>18</sup>. Simpson TC et al, 2015 concluded that there was low quality evidence, that the treatment of periodontal disease by SRP improved glycaemic control in people with diabetes, with a mean percentage reduction in HbA1c of 0.29% at 3-4 months; however, there was insufficient evidence to demonstrate that this is maintained after 4 months. There was no evidence to support that one periodontal therapy was more effective than another in improving glycaemic control in people with diabetes mellitus<sup>19</sup>.

In a meta-analysis of 10 intervention studies in order to quantify the effects of periodontal treatment on HbA1c level among diabetic patients. Three investigators extracted data regarding intervention, outcomes, and effect size. A total of 456 patients were included in analysis, with periodontal treatment as predictor and the actual change in haemoglobin A1C level as the outcome. The weighted average decrease in actual HbA1c level was 0.38% for all studies, 0.66% when restricted to type 2 diabetic patients, and 0.71% if antibiotics were given to them. It was concluded that none was statistically significant<sup>20</sup>.

#### **Effect of Antibiotics in treatment of periodontitis in diabetes patients**

In the case of infection associated with systemic signs or symptoms such as increased temperature or lymphadenopathy, a systemic antibiotic treatment also may be indicated. Antibiotic treatment such as Doxycycline (100 mg/day for 14 days), tetracycline and azithromycin in the form of either topical or systemic therapy in periodontitis patients used in combination with scaling and root planing, may help improve the glycemic control, Only when glycemic control has improved, should further periodontal therapy such as surgical care, be considered. Otherwise, the response to the treatment may be less favourable.

**Doxycycline** : Iwamoto et al in 2001 suggested, that doxycycline 10 mg, topically delivered<sup>21</sup> in periodontal pockets was more efficacious (10.5% decrease from pre-treatment level) than systemic administration of doxycycline 100 mg/day (4.7% decrease from pretreatment levels) in reducing HbA1c<sup>22</sup> (Grossi et al. 1997). In addition, it was expected that local administration would have less serious and less frequent adverse events. According to authors these facts were not known prior to this systematic review and meta-analysis<sup>20</sup> (Janket SJ et al,2005).

**Tetracyclines** : Tetracyclines and their non-antimicrobial chemically modified derivatives can

- 1) Prevent oxidative activation of latent promatrix metalloproteinases;
- 2) Downregulate matrix metalloproteinases expression; and
- 3) Prevent the body's major serine proteinase inhibitor (elastase) from both oxidative and matrix metalloproteinase-dependent inactivation.

Study has shown that Glycated hemoglobin (HbA1C) levels in type 2 diabetes patients who received periodontal treatment with tetracyclines were reduced significantly after 3 months, although the HbA 1c levels in patients who received periodontal treatment without systemic antibiotics were not significantly reduced<sup>23</sup>. The authors proposed that extracellular glycation of proteins in diabetes is inhibited by tetracycline via a non-anti-collagenase mechanism. Gingival crevicular fluid and salivary collagenase were also significantly inhibited following administration of systemic tetracycline in labile diabetics as well as in individuals with rheumatoid arthritis (Grossi SG et al,1997).

**Azithromycin** : Botero JE et al in 2013 concluded that a modest improvement in glycemic control was detected with a trend towards the use of non-surgical therapy plus Azithromycin as compared to the placebo.

#### **Effect of Photodynamic Therapy on Periodontal Status and Glycemic Control of Patients With Diabetes**

Nonsurgical periodontal therapy with or without antibiotics photodynamic therapy was also done in periodontitis to see the effect on glycemic control. A study was done to see the Short-Term Effects of Photodynamic Therapy on Periodontal Status and Glycemic control of Patients with Diabetes, results showed that there were statistically significant differences in the mean probing depth, clinical attachment level, plaque deposit, and bleeding on probing between baseline and 12 weeks post-treatment for all groups. No significant differences in periodontal parameters and glucose levels were detected among all the groups, Reduction in the mean HbA1c level after treatment was observed in all groups but was only significant for the SRP plus doxycycline group, The results of the study indicated that PDT did not benefit conventional non-surgical periodontal therapy in patients with diabetes<sup>23</sup> (Zahrani AL et al ,2009).

A study by Merchant AT et al 2016 suggested that Long-term periodontal care provided in a clinical setting improved long-term glycemic control among

individuals with type 2 diabetes and periodontal disease<sup>24</sup>

**However, the cochrane central register of controlled trials (CENTRAL)** suggested that Nonsurgical periodontal therapy did not improve glycemic control in patients with type 2 diabetes and moderate to advanced chronic periodontitis<sup>19</sup> and there was low quality evidence/ no evidence that the treatment of periodontal disease by SRP improved glycaemic control in people with diabetes<sup>20</sup>.

**Conclusion :** Despite lack of strong evidence, trends in some results support improved glycemic control after periodontal treatment in patients with diabetes. Further investigations are still necessary for better understanding of the effect of periodontal treatment on glycemic control in diabetic patients.

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# C- SHAPED ROOT CANALS : AN ENDODONTIC CHALLENGE

## Abstract

The C-shaped root canal constitutes an unusual root morphology that can be found primarily in mandibular second permanent molars. Due to the complexity of their structure, C-shaped root canal systems may complicate endodontic interventions. A thorough understanding of root canal morphology is therefore imperative for proper diagnosis and successful treatment. Effective management of this anomalous canal configuration can be achieved with rotary and hand instrumentation assisted with thorough chemical debridement and modifications in the obturation techniques will ensure a 3-dimensional fill of the canal system. This review aims to summarize current knowledge regarding C-shaped roots and root canals, from basic morphology to advanced endodontic procedures.

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## Introduction

The study of root canal anatomy is of paramount importance as it is important to be familiar with variations in tooth anatomy and characteristic features in various racial groups. Such knowledge can aid in location and negotiation of canals as well as their subsequent management.<sup>1</sup>

A C-shaped root canal system is an important anatomic variation and was first reported by Cooke and Cox in 1979.<sup>2</sup> A C-shaped root canal is defined as a root canal that in transverse section is shaped like the letter C. It is due to the presence of a thin web or fin connecting the individual root canals. The pulp chamber has a single ribbon shaped orifice with 180° arc from the distal to mesial canal. The floor of the pulp chamber is deep and has an unusual anatomical appearance. These can be classified into two basic groups: those with a single, ribbon like, C-shaped canal from orifice to the apex and those with three or more distinct canals below the C shaped orifice.<sup>3</sup>

The C-shaped canals are mostly found in mandibular second molars but its prevalence is also reported in cases of mandibular first premolars, mandibular first molars, maxillary first premolars and maxillary first molars.<sup>2,4,5</sup> A high incidence of C-shaped roots and their canals were reported in studies of the root canal anatomy of mandibular second molars from Hong Kong Chinese<sup>6</sup>, Japanese<sup>7</sup>, Chinese<sup>8</sup> and caucasians<sup>9</sup> approximating 31.5%.

The preoperative awareness of a C-shaped canal configuration enhances successful management. C-shaped canals present the clinician with an immense challenge. The high frequency of transverse anastomoses, apical deltas and lateral canals compels the clinician to use every resource at his disposal to achieve an adequately prepared canal. The purpose of this review article is to present in detail about C-shaped root canal morphology including its etiology, classification, diagnosis and management.

## Etiology

The shape and the number of roots are determined by Hertwig's epithelial sheath, which bends in a horizontal plane below the amelocemental junction and fuses in the centre leaving openings for roots<sup>10,11</sup>. Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface was the main cause of a C-shaped root, which always contains a C-shaped canal<sup>12,13</sup>. This fusion failure results in a groove on the opposite side of the root that is present coronopically<sup>12</sup>. A C-shaped canal appears when fusion of either the buccal or lingual aspect of the roots occurs. This fusion remains irregular, and the two roots stay connected by an inter radicular ribbon<sup>10,11</sup>. When examining the floor of the pulp chamber of lower molars displaying this atypical configuration, normally the entrance of the canal is observed as a C-shaped orifice (an arc of 180°), in the

form of a band, or a deep semilunar groove connecting the distal, mesiobuccal and mesiolingual canals<sup>12-14</sup>. The concavity of the C may be oriented buccally or lingually. In other cases the orifice may take the form of an incomplete C, with union of the distal and mesiobuccal canal and the presence of an isolated mesiolingual canal, giving the canals the appearance of a semicolon. It may also present as a C shaped canal with union of the distal and mesiolingual canals, and with a separate mesiobuccal canal<sup>15</sup>. The C-shaped root may also result from coalescing because of deposition of cementum with time<sup>4</sup>. Variations in the number as well as the position of the canals can occur in different thirds of the root. A tooth with a C-shaped canal orifice may have a canal system that presents a continuous C-shape from the coronal to the apical third. This canal type is also known as a true C-shape. A C-shaped canal may commonly bifurcate at any level in the root from coronal to apica<sup>18</sup>, and anastomoses between canals can also occur<sup>16</sup>.

### Classification

There are few classifications that detailed the external and internal anatomical and histologic features of C-shaped molar anatomy.

1. Melton et al. in 1991<sup>16</sup> proposed the following classification of C - Shaped canals based on their cross-sectional shape:

Category I: continuous C - Shaped canal running from the pulp chamber to the apex defines a C - Shaped outline without any separation.

Category II: semicolon-shaped (;) orifice in which dentine separates the main C - Shaped canal from one distinct mesial canal.

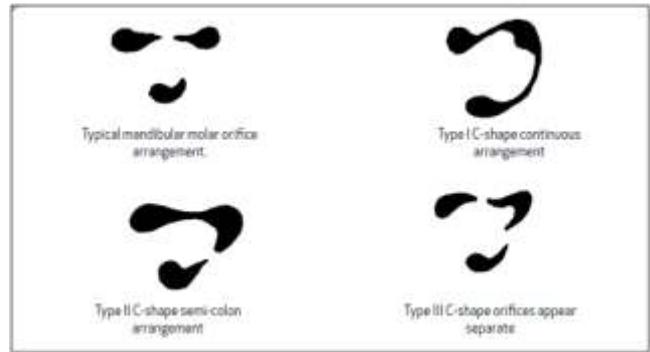
Category III: refers to teeth with two or more discrete and separate canals.

Subdivision I, C-Shaped orifice in the coronal third that divides into two or more discrete and separate canals that join apically.

Subdivision II, C-Shaped orifice in the coronal third that divides into two or more discrete and separate canals in the mid root to the apex.

Subdivision III, C-shaped orifice that divides into two or more discrete and separate canals in the coronal third to the apex.

Figure 1 : Melton's classification of C-shaped canal configuration



2. Fan's classification (Anatomic classification)<sup>17</sup>

Category I (C1): the shape was an uninterrupted "C" with no separation or division.

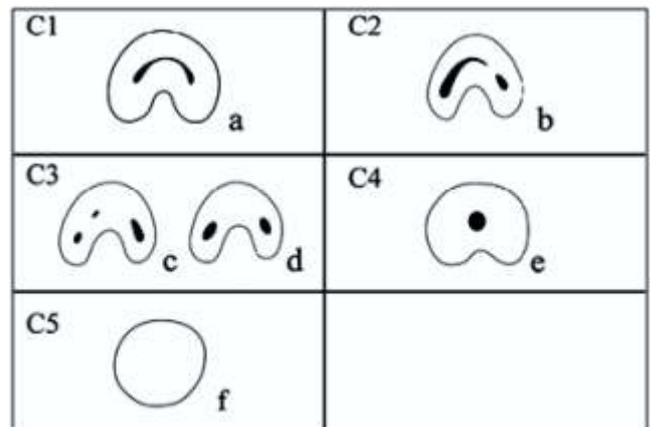
Category II (C2): the canal shape resembled a semicolon resulting from a discontinuation of the "C" outline, but either angle  $\alpha$  or  $\beta$  should be no less than  $60^\circ$ .

Category III (C3): two or three separate canals and both angles,  $\alpha$  and  $\beta$ , were less than  $60^\circ$ .

Category IV (C4): only one round or oval canal in that cross section.

Category V (C5): no canal lumen could be observed (which was usually seen near the apex only).

Figure 2. Anatomic classification by Fan et al.



Shape of canal varies along the length of the root. i. e., a canal may emerge as C1 shape at orifice, become C2 or C3 at mid root, and again C1 at apex (25).

Fan's Classification (Radiographic classification)<sup>14</sup>

Type I: Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. There was a mesial and a distal canal that merged into one before exiting at the apical foramen (foramina).

Type II: Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. There was a mesial and a distal canal, and the two canals appeared to continue on their own pathway to the apex.

Type III: Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. There was a mesial and a distal canal: one canal curved to and super imposed on this radiolucent line when running towards the apex, and the other canal appeared to continue on its own pathway to the apex.

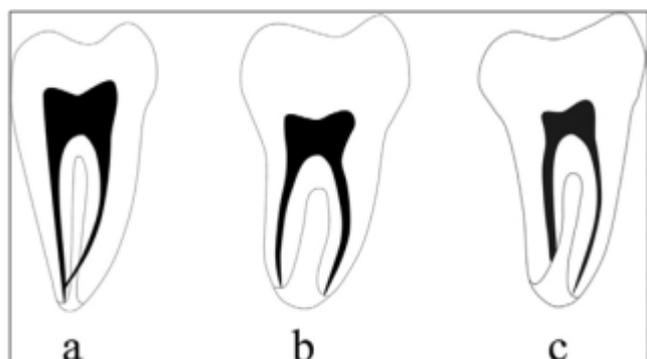


Figure 3. Radiographic types. (A) Type I, (B) type II and (C) type III

### Prevalence

C-shaped canal is quite common according to endodontic literature. This is also confirmed by various studies in which frequencies ranging from 2.7%<sup>8</sup> to 45.5%<sup>9,18,19</sup> have been reported. C-shaped canal is most frequently found in the mandibular second molar, although it could be found in the mandibular first premolar<sup>20,21</sup>, the mandibular first molar<sup>22</sup>, the maxillary first molar<sup>23,24</sup> and the maxillary second molar<sup>25,26</sup>. Bilateral occurrence of C-shaped canals has been reported in a percentage of 70%-81%<sup>13,27</sup>.

East Asian population groups like Chinese (0.6%-41.27%) and Koreans (31.3%-45.5%) display a high prevalence of this variant<sup>5,8,13,28</sup>. Among the South Asian countries, Burmese population showed a prevalence of 22.4%, which was much higher than the Indian, Thai or Sri Lankan population<sup>29,31</sup>. Higher incidence of C-shaped anatomy was documented in Lebanese population (19.1%) as compared to the other West Asian population groups (Iranian, Jordanian, Saudi Arabian)<sup>32-35</sup>. An incidence of 10% was reported in Sudanese population from the African continent<sup>36</sup>.

### Diagnosis

Practically it is quite difficult to diagnose a C-shaped canal from pre-operative radiograph, which usually shows single fused roots or images of two distinct roots. So, clinical recognition of C-shaped canal is unlikely until access to the pulp chamber has been achieved. All C-shaped canal system should exhibit the following three features: fused roots, a longitudinal groove on the lingual or buccal surfaces of the root, and at least one cross-section of the canal belongs to the C1, C2, or C3 configuration<sup>17</sup>. The C-shaped canal variation of morphology is unusual and can lead to difficulties during treatment so its early recognition at the time of diagnosis facilitates the management of such teeth.

A preoperative radiograph and an additional radiograph from 20° mesial or distal projection may help in providing clues about the canal morphology<sup>4</sup>. In the study by Haddad et al<sup>33</sup>, almost all pre-operative radiographs showed common characteristics such as radicular fusion or proximity, a large distal canal, a narrow mesial canal and a blurred image of a third canal in between.

Intra-oral periapical radiograph taken while negotiating the canals may reveal any of the following characteristics.

- instruments tending to converge at the apex
- instruments appearing both clinically and radiographically to be centered and appearing to be exiting at the furcation.<sup>4</sup>

Radiographic interpretation is overall more effective when based on film combinations (“preoperative and working length radiographs” or “preoperative and final radiographs” or “all three radiographs”) than on single radiographs. However, it is necessary to confirm the diagnosis by exploring the access cavity.

Clinical recognition of C-shaped canals is based on definite observable criteria (i.e., the anatomy of the floor of the pulp chamber and the persistence of hemorrhage or pain when separate canal orifices were found)<sup>37</sup>. The pulp chamber in teeth with C-shaped canals may be large in the occlusoapical dimension with a low bifurcation. Alternatively, the canal can be calcified, disguising its C-shape. At the outset, several orifices may be probed that link up on further instrumentation<sup>2</sup>. In a true C-shaped canal, it is possible to pass an instrument from mesial to distal aspect without obstruction. In other configurations, such passage is impeded by discontinuous dentine bridges<sup>16</sup>.

Fused roots and C-shaped roots may present with narrow root grooves that predispose to localized periodontal disease, which may in fact be the first diagnostic indication of such anatomic variance. It is equally probable that the groove will occur on the buccal or lingual surface<sup>16,33</sup>. When a deep groove is present on lingual or buccal surfaces of the root, a C-shaped canal is to be expected<sup>17</sup>.

Thus, its recognition is improbable until access to the pulp chamber has been achieved. Micro-computed tomography also helps in diagnosing C-shaped canal system in a non-destructive manner<sup>38</sup>.

## Management

C configuration is known to present a complex canal anatomy, its irregular areas house soft tissue remnants or infected debris that may escape thorough cleaning or filling procedures, thus requiring supplementary effort to accomplish a successful root canal treatment. This has provoked many modified techniques to manage such cases endodontically.

The access cavity for teeth with a C shaped root canal system varies considerably and depends on the pulp morphology of the specific tooth. Fibre-optic transillumination can enhance the variant canal anatomy identification. Also, the increased visibility afforded with the use of surgical operating microscope has made treatment more successful<sup>3,39</sup>. The C-shaped canal needs deep-orifice preparation and careful probing with small files. In every category, the mesiobuccal and distal canals are prepared as usual with a special care that the isthmus is not prepared with larger than no. 25 files in order to avoid strip perforation. The mesiolingual canal is separate and distinct from the apex, although it may be significantly shorter than the mesiobuccal and distal canals<sup>4</sup>.

Usually small files and a generous amount of 5.25% of sodium hypochlorite is required in order to carry out a thorough debridement of narrow canal isthmus. Techniques like ultrasonic canal cleaning system are also effective for this procedure. In the coronal third of the canal, the anticurvature filling method is used in order to prevent perforation<sup>4</sup>. Accessory and lateral canals, inter-canal communications and apical delta can be found in a prevalence of 11-41%, in the apical region of C-shaped canals<sup>40</sup>. Because of the large area of canal space, it is doubtful that intracanal instruments can reach and debride the entire portion of the continuum, making the irrigation procedures more significant<sup>41</sup>.

Obturation of C-shaped canals may require technique modifications. The mesiolingual and distal canal spaces can be prepared and obturated as standard canals. However, sealing the buccal isthmus is difficult if lateral condensation is the only method used. This isthmus might not be prepared with enough flare to facilitate the placement of the spreader hence the placement of the thermoplasticized gutta-percha is advisable. Obturation units such as EndoTec II and Touch 'N Heat have shown successful three dimensional obturations in C-shaped root canal systems<sup>42,43</sup>.

If post placement is required in a case with C-shaped canals, then distal canal should be considered. Post width should be kept minimal. Placement of posts or antirotational pins in the mesiolingual and mesiobuccal canals may result in perforations<sup>4</sup>.

On follow-up, if there are any chances of furcal involvement or patient is symptomatic then the last resort for the treatment of C-shaped canal system remains surgical intervention. The absence of the furcation contraindicates hemisection or root amputation. The intercanal channels or fins on the serial sections reinforce the problem the clinician may face post apicoectomy and eventual retrofilling. Therefore, strong considerations should be given to extraction and intentional replantation if endodontic surgical intervention is indicated<sup>44</sup>.

## Conclusion

The early recognition of C-shaped configuration facilitates effective cleaning, shaping and obturation of the root canal system. Although there is lesser prevalence of C-shaped canal system, when sound principles of careful diagnosis, biomechanical preparation and obturation are followed, the long term prognosis for the C-shaped root retention is equal to other molars.

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# FUNCTIONAL MODIFICATION OF NANCE PALATAL SPACE MAINTAINER FOR PRIMARY ANTERIOR TEETH REHABILITATION - A CASE REPORT

## Abstract

To maintain the arch length in the primary, mixed and early permanent dentition is of paramount importance for the normal development of occlusion. Primary concern due to premature loss of primary teeth is the loss of arch length which would cause malocclusion thereby potentiating a future orthodontic treatment. Hence, maintaining space can prevent space loss and intercept the development of a later malocclusion by guiding the eruption of permanent teeth. Premature loss of primary anterior teeth results in functional, psychological and esthetic disturbances which have a negative impact on the overall development of the child. This case report presents a modified technique for the replacement of maxillary incisors in which a new stainless steel wire design has been incorporated for better retention of the acrylic component. This novel space maintainer fulfills the requirement of the patient for esthetics and function.

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**Keywords:** Primary anterior teeth, retention, space maintainer, esthetic

## Introduction

The principle goal of pediatric restorative dentistry is to restore the damaged teeth to its normal function as well as to retain its esthetic.

For decades, esthetic restoration of severely mutilated primary anterior teeth has been a great challenge for the pediatric dental surgeon due to limited availability of cost effective materials and techniques besides the children who require such restorations are usually among the youngest and least manageable group of patients.<sup>1</sup> It is bit difficult to render intensive dental treatment in such group of patients. In many cases, destruction of whole tooth crown occurs leaving only dentin in root for bonding.<sup>2</sup> Therefore, in the past and even now, many of these teeth are extracted. Due to premature loss of primary anterior teeth it can lead to progression of some deleterious habits like forward positioning of the tongue and also causing psychological effect on child.<sup>3</sup> It also affects the speech development and ability to articulate certain sounds. All these factors necessitate the replacement of the anterior teeth by an appliance that satisfies the esthetics and functional needs.<sup>4</sup>

## Case Report

A five year old boy accompanied with his mother reported to the Department of Pedodontics and Preventive dentistry with chief complaint of missing teeth in upper front tooth region. On examination, 51 and 61 were found to be missing (Fig. 1). The patient's mother gave history of mobility of teeth due to traumatic fall about three months back. Digital radiography revealed no alveolar bone fracture and avulsion of 51 and 61 was noted. A clinical decision was made to fabricate a fixed dentulous appliance for replacing the missing anterior teeth. 55 and 65 were banded (band size: 0.005" x 0.180") and alginate impressions were made for the upper and lower arches.

Casts were poured with dental stone. On the maxillary cast, a stainless steel wire (0.9 mm) framework was made, extending from one band to the other, while making a square shape pattern in the anterior region. The anterior wire pattern was made to reinforce the acrylic segment. The ends of the wire were then soldered to the corresponding molar bands (Fig. 2).

After all necessary adjustments, the heat cured appliance is trimmed and polished as shown (Fig. 3 and Fig. 4) and then the appliance was cemented with Fuji type I glass ionomer cement (GC Corporation, Tokyo, Japan) (Fig-5). Post-operative occlusion was checked (Fig. 6). Patient was advised for regular follow ups.



(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)



(Fig. 5)



(Fig. 6)

## Discussion

The prevalence of primary tooth loss has been estimated to be as high as 28.9%, with a range of 4.3 to 42.6%. So there is a need for immediate interventions to recover the child's functional, esthetics and emotional integrity.

The premature loss of primary teeth can occur due to trauma, caries, ectopic eruption, or other causes that may lead to unacceptable tooth movements of primary and/or permanent teeth including loss of arch length. It also includes esthetic problem, tipping of adjacent teeth, over-eruption of antagonist teeth, midline deviation, masticatory impairment, speech problems and lingual dysfunction. Jytte Pedersen et al reported that early loss of primary teeth would result in an

increased frequency of sagittal, vertical as well as transversal malocclusion.

Hence, wherever possible, restoration of the natural primary tooth should be done immediately but in case of extraction or avulsion of the natural primary tooth, maintenance of the space is important so as to guide the eruption of permanent teeth.

Removable or fixed prosthesis can be used to replace primary anterior teeth in children that have been prematurely lost. Due to disadvantages of the removable appliance like patient's compliance and chance of fracture, fixed appliance is discussed here which has certain advantages and easily accepted by the patient because of its minimum amount of palatal coverage, better strength and retention. Therefore, fixed appliance i.e modified nance palatal space maintainer is a new and a novel technique which fulfills the esthetic and functional needs of the patient.

## Conclusion

Early loss of primary anterior teeth in young children not only affects the speech and function but leads to lack of confidence and self esteem. Anterior aesthetic fixed space maintainer is indeed a solution for such patients because of its acceptability and compliance of wearing the appliance and also improvements of speech, aesthetics and functional needs.

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# ORAL SEDATION: PAVING WAY FOR NON-PHARMACOLOGICAL MEANS – A CASE REPORT

## Abstract

Effective sedation during dental procedures not only provides relief from anxiety, but also frequently facilitates the successful and timely completion of the procedure. Oral sedation is one such behaviour management technique which is less invasive and more acceptable by the children. This case report describes the pharmacological management of an un-cooperative child in the dental clinic.

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**Keywords:** Anxiety, behaviour management, chloral hydrate, oral sedation

## Introduction

Young, un-cooperative children who need pediatric dental care are often a challenge for the pediatric dental surgeons. When non-pharmacological behaviour management techniques don't work owing to the child's age, anxiety level or physiological constraints then pharmacological techniques like General Anaesthesia, Oral Sedation and Conscious Sedation may become the necessary alternative.

According to American Dental Association the levels of sedation and anaesthesia have been classified into three categories: conscious sedation, deep sedation, and general anesthesia.<sup>1</sup>

**Conscious Sedation** - A minimally depressed level of consciousness that retains the patient's ability to independently and continuously maintain an airway and respond appropriately to physical stimulation and verbal command.

**Deep Sedation** - An induced state of depressed consciousness accompanied by partial loss of protected reflexes, including the inability to continually maintain an airway independently and/or to respond purposefully to verbal command.

**General Anesthesia** - An induced state of unconsciousness accompanied by partial or complete loss of protected reflexes, including the inability to independently maintain an airway and respond

Conscious sedation for young, uncooperative patients are not effective for every child. The deep sedation techniques like General anaesthesia are also not easily opted as it requires anaesthesia training or certification for their safe and proper use.<sup>2</sup> Despite being an effective and reliable means of treating unmanageable pediatric patients it is not the first choice of treatment as it is expensive, inconvenient, and involves risks.

Contraindication of general anaesthesia and conscious sedation in cases of systemic diseases makes oral sedation the first line of pharmacological management. Sedation is not a substitute for effective local anesthesia and therefore, dosage guidelines for local anesthesia based on weight should be strictly followed while treating patients under sedation.<sup>3</sup>

Nitrous oxide, opioids, benzodiazepines, chloral hydrate, barbiturates, and antihistamines are few drugs that are commonly used to produce conscious sedation.<sup>4</sup> Oral administration is the most common route of administering sedative agents to children others being nasal, parenteral and rectal. Oral sedation and other sedatives should be administered in the controlled environment of the dental facility and should only be used to achieve the desired behaviour in the child.

## Chloral Hydrate Sedation

Liebig in 1832 discovered chloral hydrate but its application in dentistry began decades later. It is the oldest and best-studied sedative-hypnotic used in

pediatric dentistry. After the absorption, chloral hydrate is rapidly metabolized to trichloroethanol (TCE) which is responsible for its sedative property and to a lesser extent to trichloroacetic acid (TCA). Its plasma half life is estimated to be 8 hours and reaches its peak plasma concentration in 20–60 minutes. Plasma concentrations of chloral hydrate are nearly undetectable after oral dosing. The primary pharmacologic effect of chloral hydrate is CNS depression. Signs and symptoms following ingestion of increasing doses of chloral hydrate progress from relaxation, lethargy, drowsiness, and hypnosis to loss of consciousness and coma. The normal range is 50 mg/kg of body weight with a suggested range of 40 -60 mg/kg.<sup>5</sup> The onset of action is rapid. Symptoms like drowsiness and arousable sleep usually develop within 30 to 45 minutes. Its duration of action lasts from 2 hours to 5 hours depending on the dosage.

It is considered safe as it has minimal effects on respiratory and cardiovascular function.<sup>6</sup> Adverse effects of chloral hydrate administration are rare. It may cause nausea, vomiting, depressed blood pressure and respirator rate and prolonged drowsiness. However, it is contraindicated in children with heart disease as it may produce peripheral vasodilatation, hypotension, arrhythmias, and myocardial depression. It is also avoided in those with hepatic and renal impairment as it can cause significant drug and metabolite accumulation.<sup>1</sup>

### Case Report

A 3 year old male child accompanied by his parents reported to the department of Pedodontics and Preventive Dentistry with a chief complaint of decayed teeth in the upper front tooth region. It was child's first dental visit and he showed Frankl's Definitely Negative behaviour. No relevant medical history was given by the guardian. The child weighed 12 kgs and was 102 cm tall. On the first visit the child refused to sit on the dental chair and despite trying various non-pharmacological behaviour management techniques, the child did not get his oral check up done. After several attempts oral examination was done (Figure 1) and it revealed decayed 51,61,62 and carious 54,63,64,74,84. (Figure 2 a, b, c). Orthopantomogram and IOPARs confirmed the diagnosis of chronic irreversible pulpitis w.r.t 51,61,62,64 and dental caries in 54,63,64,74,84. (Figure 3 a, b) Examination and taking intra oral pictures took several sittings as the patient's behaviour didn't improve despite using various non-pharmacological behaviour management techniques. Therefore, it was decided to

provide dental care to the patient under oral sedation. The physical status of the child was Class I as per American Society of Anesthesiologists.



Fig. 1: Pre-operative image of child showing Frankl's definitely negative behaviour



Fig. 2 a: Pre- operative Intra-oral maxillary view



Fig. 2 b : Pre- operative Intra-oral left lateral view



Fig. 2 c: Pre- operative Intra-oral right lateral view

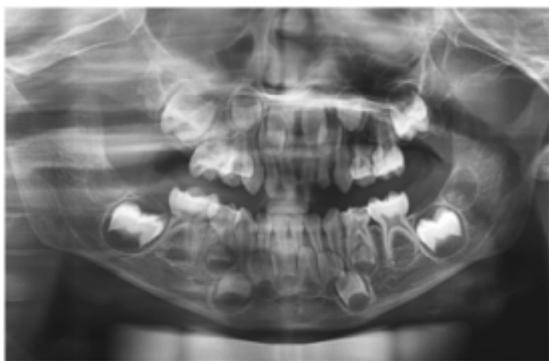


Fig. 3 a: Pre- operative Orthopantomogram



Fig. 3 b: Pre- operative intra-oral periapical view i.r.t 51,61,62,63

### Preparation for the procedure

After explaining the process consent for the treatment was taken from the parents. Opinion was taken from child's physician to ensure that the child is suitable for oral sedation.

An afternoon appointment was scheduled for the patient. The parents were advised to involve the child in physical activities before the appointment in order to make the child tired. An enclosed operatory set up was prepared for the treatment as noise or light could hinder the process. (Figure 4)



Fig. 4: Special isolated operatory prepared for the dental treatment under oral sedation

### On the day of the appointment

The guardian was advised to give the child a light meal an hour before the appointment. The child's mother was asked to give the drug to the child under the supervision of the dental surgeon. 5 ml Chloral Hydrate Triclofos Sodium IP 500 mg (Pedicloryl, Dr. Reddy's (Figure 5 a,b) . The drug dosage was calculated as the normal range being 0.5 - 1 mg/kg , the child weighed 10kgs therefore, 5ml was given. After this the child was made to rest in the dental operatory on his mother's lap. (Figure 6) After 20 minutes it was seen that the child became relaxed and drowsy however, responded to the questions asked. The child's eyes were covered with a cloth to avoid distraction from the light. (Figure 7). Single sitting pulpectomy was done w.r.t 51,61,62 under local anesthesia. Access was achieved with the help of spoon excavator as the dentin was soft enough. No air rotor was used to avoid disturbance from its noise. (Figure 8) During the treatment fast movements and jerks were avoided. Any kind of noise was also prevented to ensure that the child stays drowsy. The treatment time was 45 mins and before leaving the dental operatory it was ensured that the child was awake by having interactive conversation with him along with few physical activities. The parents were made to wait for 30 mins after the treatment to monitor the child.

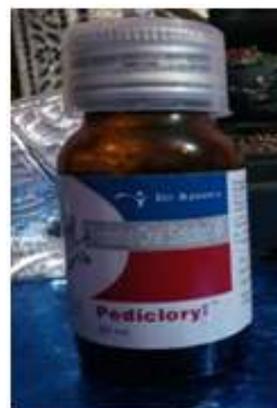


Fig. 5 : Chloral hydrate syrup



Fig. 5 b: Mother of the patient giving him the drug for oral sedation



Fig. 6: Child was seated on the dental chair with the mother who made him relax.

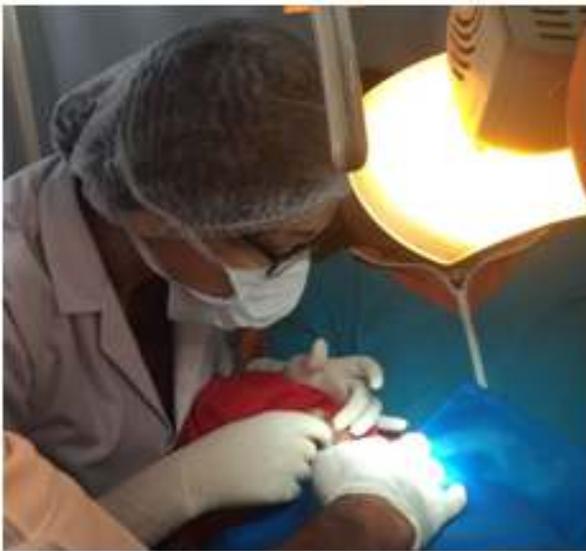


Fig. 7: Eyes of the child were covered with a cloth to avoid disturbance from the light.



Fig. 8: Access opening was done with a spoon excavator.

### Treatment

In the next visit the same protocol was followed for access opening w.r.t 64 but at this visit the child seemed more relaxed and hence access air rotor was used. After the 3<sup>rd</sup> visit it was observed that the child showed slightly positive behaviour as he greeted cheerfully on his arrival to the operatory and responded well to the questions asked. The child was moved from the isolated room to the normal operatory and then pulpectomy of 64 was completed using non-pharmacological behaviour management techniques like Tell-Show-Do and Modelling. Once the desired behaviour was obtained the child was positively reinforced with a reward. (Figure 9) Oral Sedation was used only for the first three appointments. Strip crowns were given in 51, 61 and 62. (Figure 10) Stainless steel crown was given to restore 64,74 and 84 and restoration was done w.r.t 54 63 and 84. (Figure 11 a,b,c,d,e) The patient was recalled every 3 months for follow-up after the treatment was completed.



Fig. 9: Child was shifted to normal operatory after showing Frankl's positive behaviour.



Fig. 10: Strip crowns were placed to restore 51, 61,62



Fig. 11 a: Post Operative Intra-oral view maxilla



Fig. 11 b: Post Operative Intra-oral view mandible



Fig. 11 c: Post Operative Intra-oral frontal view



Fig. 11 d: Post Operative Intra-oral left lateral view



Fig. 11 e: Post Operative Intra-oral right lateral view

### Discussion

Children with anxiety in the dental clinic are much more likely to delay or avoid dental treatment and may prove difficult to treat, require more time, and present with behavioural problems which can result in a stressful and unpleasant experience for both the patient and treating dental practitioner.<sup>7</sup> Due to the negative impact of dental fear for all concerned, it is important that patients with dental fear are managed correctly. In the present case the child showed refusal of treatment, cried forcefully, fearful, showed extremely negative attitude hence his behaviour was classified as Frankl's Definitely Negative behaviour.

The treatment was done under oral sedation because other all the other non-pharmacological behaviour management did not prove to be beneficial. Opting for more technique sensitive methods like general anesthesia and conscious sedation wasn't considered as oral sedation is less invasive and more accepted by the child than nasal sedation. This was in accordance with the study done by Subramaniam P.<sup>8</sup> Also oral sedation is inexpensive, easily administered, has lesser incidence of adverse reactions and the severity of adverse reactions is lesser as compared to the other pharmacological techniques.

Chloral hydrate was the drug of choice for the sedation because its rate of onset is faster and duration is shorter than the other drugs which makes it suitable for being used in children. Chloral hydrate has less adverse effects when compared to Barbiturate and Opioid sedation.<sup>9</sup>

Chloral hydrate is also used along with Nitrous Oxide for inducing conscious sedation. In a survey conducted by Houptin 1989 on more than 1100 pediatric dentists, the most frequent drug regimen was chloral hydrate with hydroxyzine and nitrous oxide.<sup>10</sup> Nathan and West in 1987 proposed a combination of meperidine with chloral hydrate orally. They chose oral meperidine as a co-medicament with chloral hydrate because of meperidine's analgesic qualities.<sup>3</sup>

In this case with the use of oral sedation the child showed improvement in his behaviour on subsequent visits which were similar to the conclusion made by Howitt and Stricker, Venham and Quatrocelli, and Venham and Cipes.<sup>11,12,13</sup> Using pharmacological technique like oral sedation in the initial appointments made the non-pharmacological behaviour techniques like Tell-Show-Do and Modelling more successful in the child. It helped to achieve the desired behaviour and provide the best available treatment for the child.

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# REHABILITATION OF A SEVERELY WORN DENTITION – A CASE REPORT

## Abstract

The gradual wear of the occlusal surfaces of teeth is a normal process during the lifetime of a patient. However, excessive occlusal wear can result in pulpal pathology, occlusal disharmony, impaired function, and esthetic disfigurement. Therefore, it is important to identify the factors that contribute to excessive wear and to evaluate alteration of the VDO caused by the worn dentition. This case report deals with the successful rehabilitation of a patient with severely worn dentition with fixed and removable prosthesis.

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**Keywords:** Worn dentition, Fixed removable prosthesis, Vertical dimension of occlusion

## Introduction

Occlusal wear is most often attributed to attrition, which is defined as wearing away of one tooth surface by another tooth surface. However, there are several etiological factors that can result in excessive loss of tooth structure. Common factors are enumerated as congenital anomalies, parafunctional occlusal habits, abrasion, erosion or loss of posterior tooth support.<sup>1</sup> Occlusal and incisal attrition may occur during deglutition (physiological wear) and may be severe if parafunctional activities such as bruxism and clenching habits exist (pathologic wear). Shiny dental surface and well-defined facets are considered reliable signs of attrition that usually match facets of teeth in the opposing arch in eccentric occlusion, especially in anterior antagonists<sup>2,4</sup>. Such facets are mostly seen on functional surfaces (occlusal and incisal) of teeth but may affect buccal and palatal surfaces of the teeth in the anterior mandible and maxilla when a deep vertical overlap is present<sup>5</sup>. In attrition the wear rate in the upper and lower jaw are equal because intimate contact of opposing surfaces can result in matching wear facets<sup>6</sup>. Therefore, it is important to identify the factors that contribute to excessive wear and to evaluate alteration of the VDO caused by the worn dentition.<sup>7</sup> In many cases, the vertical dimension of occlusion (VDO) is maintained by tooth eruption and alveolar bone growth. As teeth are worn, the alveolar bone undergoes an adaptive process and compensates for the loss of tooth structure to maintain the VDO. Therefore, VDO should be conservative and should not be changed

without careful approach.<sup>8,9</sup> Especially, increasing the VDO in bruxers puts a severe overload on the teeth and often results in the destruction of the restorations or teeth themselves.<sup>8</sup> However, the rehabilitation of the severely worn dentition is challenging and the most difficult cases to restore when the space for restoration is not sufficient in terms of both the difficulty and expense of providing a functional comfortable and cosmetically acceptable treatment of the patient. This clinical case report discusses the phases of prosthodontic rehabilitation, from diagnosis to final treatment, of a 68 year old bruxer with severely worn dentition.

## Case Report

A 68 year old male patient reported to the Department of Prosthodontics, Manav Rachna Dental College, Faridabad with a chief complaint of several missing teeth, excessive wearing away of teeth, reduced chewing efficiency, and poor esthetic appearance (Fig 1). Past medical history revealed that the patient had an irritable bowel syndrome and hypertension and was on medication for the same. No other remarkable findings were found in his medical history.

Dental examination revealed partially dentate maxillary and mandibular arches with 17, 26, 27, 34, 36, 37, 46, 47 missing. All the remaining teeth revealed severe attrition especially maxillary anteriors which showed attrition till gingival level (Fig 2). On extra oral examination the

patient had no asymmetry and had competent lips and no signs or symptoms (pain, limited range of jaw opening, or clicking) of temporomandibular joint disorder (TMD) were detected. Initial evaluation of the patient revealed parafunctional habits of bruxism and clenching. Well-defined facets matching those on the opposing teeth in eccentric occlusion were also detected. A discrepancy between the centric relation (CR) and maximum intercuspal position (MIP) was found. On the basis of clinical and radiographic examination, (Fig 3) the patient was diagnosed to have excessive wear with loss of occlusal vertical dimension (Turner's category no. 1: closest speaking space is more than 1mm and the interocclusal space is more than 4mm and has some loss of facial contour that includes drooping of the corners of the mouth)<sup>10</sup>. According to prosthodontics diagnostic index, patient was classified as PDI class IV with insufficient tooth structure and requiring re establishment of the occlusion with a change in the occlusal vertical dimension.<sup>11</sup> All possible modalities and their prognosis were discussed with the patient. A treatment plan was drawn up with the following aims: restoring the occlusal vertical dimension, improving the esthetics and restoring the masticatory function and comfort of the patient. Root canal treatment and Metal ceramic crowns were planned for restoration of attrited teeth and a removable prosthesis for the missing teeth.



Fig. 1: Frontal Profile



Fig. 2a: Maxillary View



Fig. 2b: Mandibular View



Fig. 3: OPG after completed RCT's

### Procedure

The first phase of treatment was RCT of exposed teeth. Prior to definitive treatment, maxillary and mandibular impressions were made in alginate (Zelgan, Dentsply India Ltd.) (Fig 4) to fabricate the diagnostic casts (Fig. 5). Occlusal vertical dimension and vertical dimension at rest were assessed by phonetic evaluation (Pound<sup>12</sup>

and Silverman<sup>13</sup>), measurement of interocclusal space (Niswonger)<sup>14</sup> and evaluation of facial appearance as described in literature. Maxillary cast was mounted on a semiadjustable articulator (Whip mix Corporation) using a quick mount earpiece type of facebow whereas the mandibular cast was mounted in centric relation at the established occlusal vertical dimension (Fig. 6). The bite registration procedure was accomplished by acrylic anterior deprogramming jig (Lucia jig) in the anterior region and modelling wax (Y Dents, MDM Corp) in the posterior region. The mandible was guided into CR by bimanual manipulation technique.<sup>15</sup> A temporary acrylic splint was fabricated and delivered to the patient at the established occlusion vertical dimension and was instructed to wear it for maximum permissible hours per day for 3 weeks. During this period various aspects were constantly monitored, such as muscle tenderness, extension of mandibular movements, swallowing, mastication and speech. The splint assisted in deprogramming the muscles of mastication and in assessing the effect of increased occlusal vertical dimension on the TMJ and surrounding musculature. Improvement in speech, esthetics and comfort confirmed the patient's tolerance to the new mandibular position with the restored OVD. On the basis of these observations, it was decided to proceed to the definitive oral rehabilitation at established OVD.



Fig. 6: Mounting of Diagnostic Casts

### Diagnostic wax up

A diagnostic wax up was done on the maxillary and mandibular casts to establish group function occlusion, which helps to distribute the forces over the greatest possible area on the working side during lateral excursions of the mandible. Group function occlusion scheme was preferred over canine guided occlusion as canine (23) was endodontically treated and was planned for post and core retained crown. So, it was not considered to take the entire load during lateral excursions of the mandible. The diagnostic wax-up was shown to the patient for his consent.

### Definitive treatment planning

Post and cores were done in 12, 21, 22, 23, 24, 25 as minimal coronal tooth structure was left. Tooth preparations of mandibular teeth followed by maxillary teeth were completed (Fig. 7) and impression was made using polyvinyl siloxane impression material (Affinis, Coltene) (Fig. 8) The master casts were poured in die stone (Kalrock-type IV dental stone, Kalabhai Karson Pvt Ltd.). A wax bite was recorded using modelling wax (Y Dents, MDM Corp) at the established vertical dimension. Auto polymerising acrylic resin provisional restorations (DPI-RR Cold Cure) were fabricated according to the diagnostic wax-up and were cemented with temporary cement (Protemp, 3M ESPE products) (Fig. 9). Metal copings were fabricated and a metal coping try in was performed in the patients mouth (Fig. 10). Final PFM crowns were fabricated.



Fig. 4: Diagnostic Impression



Fig. 5: Diagnostic Casts



Fig 9: Temporary crowns cemented



Fig. 10: Metal Coping Try In Done

Fig. 7: Tooth Preparation



Fig. 8: Impression made with Polyvinyl Siloxane

### Fabrication of acrylic prosthesis

After PFM crowns were cemented on the maxillary and mandibular teeth (Fig. 11). A special tray was fabricated using auto polymerizing acrylic resin (DPI – RR Cold Cure). Border moulding was done with green stick compound (Pinnacle, DPI, India). Zinc oxide eugenol impression (DPI Impression Paste) of maxillary and mandibular arch was made and then a pick up impression was made using alginate (Zelgan, Dentsply). Impressions were poured in dental stone (Kalstone, Kalabhai Karson Pvt. Ltd.). Master casts were obtained. Occlusal rims were fabricated using modelling wax (Y Dents, MDM Corp). Bite registration was done. The artificial teeth were selected and arranged in centric relation. The denture try in was carried out and patient's consent was obtained. The conventional procedures of flasking, dewaxing were performed. Then curing, finishing, and polishing of the dentures were carried out.



Fig. 11a: PFM Crowns Cemented (Lateral View)



Fig. 11b: PFM Crowns Cemented (Frontal View)



Fig. 12: Insertion of Removable Prosthesis

### Final delivery of the prosthesis

Prosthesis was delivered to the patient (Fig. 12). PFM crowns were cemented on the maxillary and mandibular teeth. Oral hygiene instructions were given to the patient. He was advised to brush teeth twice a day and use dental floss at least once a day to clean the interproximal spaces between the crowns. He was advised to remove the acrylic prosthesis during night to give rest to the mucosa and clean it every morning before wearing it. Patient is being followed up regularly and is satisfied with the performance of the prosthesis (Fig. 13). There is no complaint of any pain or discomfort in the TMJ.

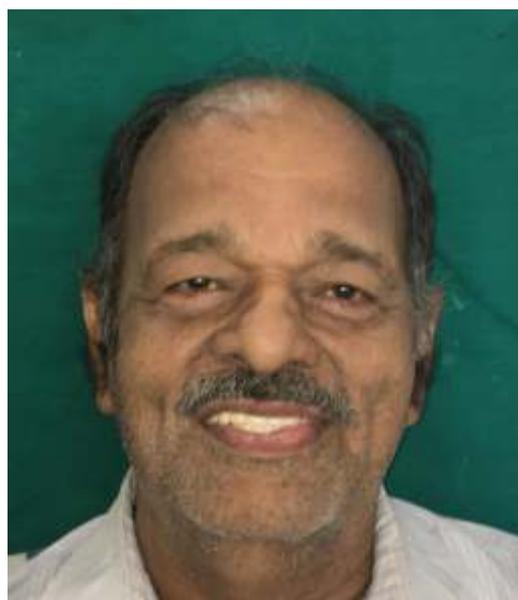


Fig. 13: Post Operative Photograph

## Discussion

Tooth surfaces can undergo erosion, attrition, and abrasion.<sup>16</sup> Tooth wear may be generalized or localized to incisors and canines and has a multifactorial etiology.<sup>17</sup> The number of clinical controlled trials on restorative and prosthodontics approaches in this respect is sparse. Insufficient evidence regarding the long-term clinical outcome of treatment can complicate clinical decision making<sup>18</sup>. The etiology of wear should be determined before any intervention. The reconstruction of a severely worn dentition is very complex and difficult problem for the dentist.<sup>19</sup> Excessive wear due to any reason can adversely affect esthetics, function and health of stomatognathic system. So it becomes important to restore it with any of the suitable treatment options available. A wide range of restorative treatment options are possible with today's materials and techniques. The rehabilitation using restoration of anterior crowns and RPD providing posterior support is affordable and common for many patients who require the treatment of teeth wear.<sup>20</sup> However, the restored anterior teeth can be easily exposed to excessive occlusal loads if the patient does not wear the RPD or resorption of residual ridge proceeds. Because the compliance of patients in wearing free-end saddle dentures has been shown to be poor, the education on wearing RPD is necessary.<sup>21</sup> Fixed and removable prosthesis were planned for this patient. This approach provides a relatively simple, non-invasive and cost-effective way to achieve improvements in appearance and function of the dentition. In this patient there was a restricted interocclusal space with collapsed OVD and early loss of posterior mandibular teeth and need for reorganization of occlusion. When reorganising the occlusion, it is essential to precede restorative procedures with a period of occlusal device therapy to ensure that a stable maxilla-mandibular relationship has been achieved.<sup>22</sup> An acrylic splint was given to the patient to ensure his accommodation to increased OVD before any restorative treatment was initiated. This approach provided a safe and conservative route to meet the patient's requirement. A multidisciplinary approach was taken to rehabilitate the patient's mutilated dentition in an organised way. The integration of fixed and removable prosthodontics has resulted in accurately fitting, esthetic and functionally efficient prosthesis. Periodic follow-ups and proper prosthesis maintenance by the patient will hold the key for the ultimate success of these types of rehabilitations.

## Conclusion

Full mouth reconstruction in wear patients is one of the most common treatment options. Optimum oral health should be the prime objective of all rehabilitation procedures because the ultimate goal will always be to restore the mouth to health and function and preserve this status throughout the life of the patient. The mystery of excellent prognosis is keyed to an accurate anterior guidance that is in harmony with the envelope of function and has sufficiency in posterior disclusion.

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# CONVENTIONAL IMMEDIATE COMPLETE DENTURE : A CASE REPORT

## Abstract

In the era of implant and immediate implant treatment, immediate complete denture treatment should still be considered as an important treatment modality. Immediate dentures allow patients to continue their social and business activities without being in edentulous state by providing the patients with esthetics, function and psychological support after extractions and during the healing phase. However, success of the immediate denture depends on the correct indication and precise execution of clinical and laboratory procedure. The case report presents a clinical case that requires prosthetic rehabilitation of her missing teeth while being in late stages of aggressive periodontitis.

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**Keywords:** Immediate Complete denture (ICD), Conventional Complete denture (CCD), Interim/Transitional complete Denture (TCD)

## Introduction

Immediate denture<sup>1</sup> is a dental prosthesis constructed to replace the lost dentition and associated structures of maxilla and mandible and inserted immediately following removal of remaining teeth. When removal of teeth becomes necessary an immediate denture is an important treatment modality as it provides restoration of phonetics and masticatory functions and facilitates transition of the edentulous state. Also it enables the patient to continue to engage in social and business activities without an embarrassing period of staying edentulous. Thus prosthodontic management with immediate denture can spare the patient from stigma of being seen in public without teeth who requires extractions as a definitive treatment plan.

In theory, immediate dentures may be defined as interim or conventional. In the former, an existing (partial) prosthesis is converted into a complete denture. In the latter, conventional wisdom recommends that posterior teeth distal to the first premolar teeth are extracted, the ridges allowed to heal for 2–3 months and the anterior teeth subsequently extracted and a conventional immediate denture inserted.<sup>2,3</sup>

An immediate denture must be compatible both biologically and physiologically with the oral environment. It should restore mastication, speech and deglutition to as near normal as possible. It must also be aesthetically compatible and preserve the remaining oral tissues.<sup>4</sup> Immediate denture presents numerous

advantages<sup>3</sup> such as, a) the denture acts as a protective splint for the extraction wound and prevents injury, b) protection of the blood clot, c) no compromise in functions of oral cavity like speech, deglutition and mastication, d) no period of edentulousness for the patient and e) maintaining of vertical dimension of occlusion.

Though the advantages are seemingly convincing, it also has disadvantages<sup>3</sup> like a) stimulation provided by the natural teeth is absent, b) it involves a precise and time consuming protocol, c) absence of anterior try for aesthetics. Also there are some contraindications<sup>3</sup> to immediate dentures, such as cardiac, endocrine, and blood disturbances, slow healing potential, acute periapical diseases, extensive bone loss, or emotional disturbances, mental incapacity, indifferent and unappreciative patients.

All the mentioned factors must be kept in mind before proceeding with the construction of immediate denture. However the success of the immediate denture depends on the correct indication and precise execution of clinical and laboratory procedure.<sup>4</sup>

## Case Report

A female patient aged 52 years reported to the Department of Prosthodontics, Manav Rachna Dental College, Faridabad with the chief complaint of missing

right lower posterior and upper anterior teeth. Detailed case history was recorded. Intra oral examination revealed Grade III mobility of remaining natural teeth which made fabrication of conventional cast partial denture prosthesis impossible. Other treatment possibilities were explored accordingly and fabrication of immediate denture was finalized.

The treatment protocol of the patient was divided into three phases namely a) Examination of the patient b) Consultation and interview of the patient c) Treatment phase. Initial patient examination included evaluation of local and systemic factors like condition of the teeth to be extracted, position of the teeth in the arch, presence of either bony or soft tissue undercuts and muscular coordination of the patient. Also various systemic conditions which pose threat for the fabrication of prosthesis were examined and ruled out accordingly.

An orthopantomograph of the patient was undertaken (Fig. 1). In the interview phase, the patient was explained about the procedure involved in the fabrication of the prosthesis. The expectation of the patient from the prosthesis was noted down. The role of patient in maintenance and care of the dentures were also explained at this phase of treatment planning. Extra oral and intra oral photographs of the patient were made. Extra oral photographs included profile and frontal view (Fig. 2). Intra oral photographs of maxilla and mandible (Fig. 3) were made with special care of anterior teeth which helps in shade selection.



Fig. 1: Orthopantomograph



Fig. 2: Profile Pictures



Fig. 3: Intraoral photograph

The existing vertical dimension at rest and occlusion were recorded and noted down. The patient was then referred to Department of Oral and Maxillofacial Surgery for extraction of all the posterior teeth in maxillary and mandibular arch except 15, 24, 34 and 44 which acted as vertical stop and preserved the original vertical dimension at occlusion of the patient. Patient was advised to return back after 6-8 weeks, once the healing was complete. Patient reported after 6 weeks and healing was satisfactory. (Fig. 4)



Fig. 4a: Before posterior teeth extraction



Fig. 4b: After posterior teeth extraction

Primary impression was recorded using irreversible hydrocolloid and casts were poured using type IV dental stone. Special tray was made on maxillary and mandibular cast using auto polymerizing acrylic resin and then the border molding was done with green stick impression compound (DPI Pinnacle Tracing Sticks). Secondary impression was made with zinc oxide eugenol (DPI impression paste) and pick-up/ dual impression was made with irreversible hydrocolloid for both the maxillary and mandibular arch. Casts were then poured using type IV dental stone. Technique thus followed for recording impression was in accordance to

Campagna<sup>5</sup>. Base for the cast were fabricated as per necessary dimensions. Temporary denture base was made on maxillary cast using auto polymerizing acrylic resin and occlusion rims were constructed. Tentative jaw relations were recorded which were obtained in accordance to the original vertical dimension due to presence of vertical stops and a facebow transfer was done. The casts were mounted on a semi-adjustable articulator (Fig 5). Posterior try in was done and tentative jaw relation was verified (Fig 6).



Fig. 5: Posterior teeth setting



Fig. 6: Posterior try in

The teeth to be extracted were scraped on the cast using BP blade as described by Standard<sup>6</sup>. It was scrapped in such a way that 2mm of the cast from the attached gingiva was removed. This was done to compensate for the shrinkage of soft tissues post extraction. All the undercuts and sharp margins were rounded off on the cast. Teeth selection was done before extraction keeping in mind the shade, shape and size of the teeth to be extracted, to mimic them as far as possible. Then teeth arrangement was carried out and wax up was done (Fig. 7). The denture was processed using heat polymerized acrylic resin. Then the patient was again referred to the Department of Oral and Maxillofacial Surgery, Manav Rachna Dental College, Faridabad for extraction of the remaining anterior teeth in both the arch. Extraction of the teeth were done as atraumatically as possible (Fig. 8).



Fig. 7: Anterior teeth scraped and teeth setting done in wax



Fig. 8: Extraction of remaining anterior teeth

After proper irrigation of the extraction socket with antiseptic (Betadine) solution, the denture was tried in mouth with utmost care to prevent injury to the extraction socket. All the sharp margins were rounded off. Occlusion was analyzed using articulating paper and premature contacts in the denture were removed. Dentures were then lined with a tissue conditioning material ViscoGel (De Trey Dentsply) before final insertion (Fig. 9). Post denture insertion instructions were given to the patient.



Fig. 9: Denture insertion after soft tissue relining

He was asked not to remove the dentures for first 24 hours after insertion. This aids in stabilization of the blood clot that was formed. Patient was then recalled after 24 hours of insertion. Occlusion was checked with articulating paper. The denture was carefully removed and tissues were evaluated. Tissue surface of the denture was evaluated with pressure indicator paste. Specific complaints of soreness by the patient were also evaluated. Soft tissues were examined for any irritation and ulceration which were relieved in the denture. Also initial relining done was replaced at each appointment by the same tissue conditioning material Viscogel (De Trey Dentsply). After 48 hours the patient is seen again. Everything done at the first appointment is repeated. The patient is instructed to clean the denture several times a day and to utilize warm saline rinses. The patient was asked to wear the denture at night for three days following insertion.

Patient was then recalled again at 72 hours of initial insertion and again relining was done with tissue conditioning material Viscogel (De Trey Dentsply). From this appointment patient was asked to keep the denture out at night. The patient was asked to continue using the prosthesis and was rescheduled after a week for further check up and then recalled after 6 weeks. Patient was happy with the esthetics of the denture and its performance during mastication. So after 6 month once the healing was complete both the dentures were relined with heat cured acrylic resin.

## Discussion

Socially active people with periodontally weak anterior teeth, which are indicated for extractions and cannot be restored to their health and function by any other treatment modality. Immediate dentures provide a valuable and reliable treatment option for these patients

as they are very self conscious about their appearance and always wish to retain their natural appearance in order to continue with their daily routine life. However patients with similar conditions but who are uncooperative, elderly, suffering from systemic and debilitating diseases, indifferent and emotionally disturbed or with poor general health are not considered good candidates for immediate denture.<sup>7</sup>

Patient's cooperation towards the treatment plays a major role in success. Philosophical patients are the best candidates for this kind of treatment procedure.<sup>5,6</sup> In interview phase all the procedures involved in fabrication of an immediate denture must be clearly explained to the patient. He/she must be psychologically counselled and motivated to accept the treatment. Also the expectation of the patient from the treatment must be addressed by the prosthodontist. As tissues heal after extraction there is a tendency of the dentures to lose their retention. Relining is necessary, which also has to be explained to the patient. Home care instructions for the patient must be verbally given and a written copy must be provided. Patient should be asked to report to the dental office if he/she has any discomfort with the prosthesis and it must be dealt with utmost care and attention.<sup>4</sup>

Different authors have suggested different techniques for making final impression. Payne<sup>8</sup> suggested that preliminary alginate impressions should be poured twice (once with teeth in wax and once in stone) and be used as final impression. Gardner<sup>9</sup> gave sectional impression technique using Poly vinyl Siloxane. Impression was made in accordance to the technique by Campagna<sup>5</sup> who suggested that after posterior teeth have been extracted and healing has occurred, edentulous area should be recorded with wash impression in custom tray border molded with green stick and dentulous area to be captured in an alginate over- impression.

Modification of cast at the intended area is very critical in the fabrication of an immediate denture. Standard<sup>6</sup> used three pencil markings placed at a distance of 2mm each to 3 assist in cast modification. Jerbi<sup>10</sup> described three markings on the facial surface dividing it into cervical, middle and apical 4 thirds. Recently Phoenix and Fleigel<sup>11</sup> proposed spatial modelling technique for cast modification. Though there are numerous techniques proposed, they are aimed at providing space for prosthetic teeth and need for avoiding radical alveoloplasty.<sup>6</sup> In the presented case modification of the cast was done in accordance to the technique described by Standard<sup>6</sup>, as it was found to be most simple and easy to follow.

The role played by oral surgeon in such a treatment procedure is also important. Good understanding between the prosthodontist and oral surgeon is essential. Teeth extraction must be carried out in a least traumatic way. Errors like fracture of cortical plate, tearing of mucoperiosteal flap must be avoided, which may reduce the rate of success of the treatment. When patients require total extraction and an immediate complete denture, a clear acrylic surgical stent may be fabricated to act as a guide to the surgeon while bone contouring. This will ensure a comfortable wearing of the prosthesis immediately after extraction.<sup>12</sup> So a surgical stent was fabricated on the modified cast to guide the surgeon for determining the level of bone contouring required.

A properly contoured and finished prosthesis greatly assists in healing of the wound. It will act as a stent or bandage to protect the wound from external trauma and prevents food debris and saliva coming in contact with the wound. Additionally it also protects the blood clot. Any sharp margins on the denture may cause inflammation of the oral mucosa which may cause an additional burden on healing which must be avoided. The surface of the denture must be polished well so that food accumulation will be prevented and oral hygiene can be maintained easily by the patient. Also the denture must not exhibit any harmful forces on the ridge which may cause blanching of the underlying tissues. Pressure indicating pastes can be used in such cases to identify the pressure spots in tissue surface of the denture and relieve them accordingly.<sup>13</sup>

Patient showed no significant alterations in oral motor skills, although most of the speech was not affected, there was alteration of acoustic characteristics associated with complete dentures. Ridge resorption was most rapid during the first half-year and denture relining with correction of vertical dimension at occlusion (VDO) was indicated. The accompanying alterations in soft-tissue profile showed an antero-superior change in position of the soft-tissue chin and mandibular lip (mean 4 mm) and a more superior and anterior position of the maxillary lip (mean 2 mm). Results were congruent to Tallgren<sup>14</sup> who concluded that there is a decrease in the vertical dimension at rest (VDR) and vertical dimension at occlusion (VDO), and the centric relation (CR) position moves forward in the period of 1 week to 3 months post immediate denture insertion.

## Conclusion

In the era of implant and immediate implant treatment, immediate complete denture treatment should still be considered as an important treatment modality. Immediate dentures allow patients to continue their social and business activities without being in edentulous state by providing the patients with esthetics, function and psychological support after extractions and during the healing phase. However this advantage can be demanding and challenging, so it is important for both the patient and the dentist to understand the limitations of the procedure.

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### Abstract

Mucoceleles are known as “mucus filled cavities” present in the oral cavity occur mainly due to mechanical trauma causing rupture of ductal system of salivary gland and mucin spills into adjacent soft tissues. These may interfere with mastication, speech and esthetics. The present case report illustrates the excision of mucocele using 940 nm Diode Laser.

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### Introduction

Mucoceleles are known as “mucus filled cavities” usually present in the oral cavity, lacrimal sac, and paranasal sinuses.<sup>1</sup> Mucus extravasation and mucus retention are the two most frequently occurring primary mechanical obstructive diseases of salivary glands.<sup>2</sup> Formation of mucus extravasation cyst is mainly due to mechanical trauma causing rupture of ductal system of salivary gland and mucin spills into adjacent soft tissues.<sup>3,4</sup> Mucus retention cyst is formed markedly by obstruction of salivary ductal walls causing dilatation of ducts without spillage of mucin.<sup>5,6</sup>

### Case Report

A 6-year-old female patient reported to the OPD of Department of Periodontology with the chief complaint of swelling in the lower left labial mucosal region for the past few months that often interfered in mastication.

On clinical examination, lesion was soft, painless, dome like, fluid-filled and approximately 1 × 1cm in size. The history and clinical presentations were consistent with mucocele. Various treatment modalities such as surgical incision, cauterization, and laser excision were explained to the patient's guardian and a written informed consent was obtained to perform the most recent treatment option of laser excision.

Following minimal infiltration of 1:80,000 Xylocaine, the lesion was excised using soft diode laser in wavelength of 940nm, 400 $\mu$ m diameter tip at 1.5W in continuous mode. The incision was placed on the uppermost site of the lesion and complete excision was performed. The specimen was subjected to

histopathological examination. Patient was prescribed analgesics.



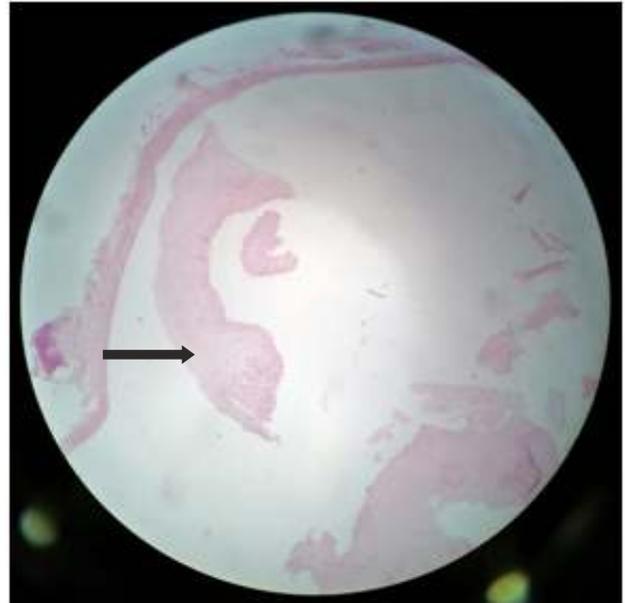
Pre-operative



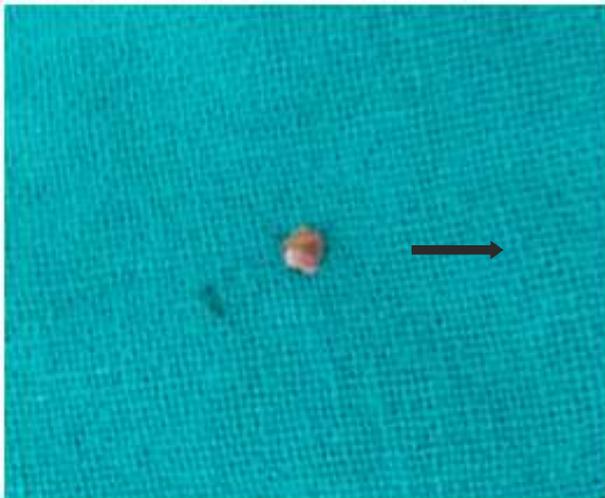
Intra-operative: Mucocele circumscribed with suture



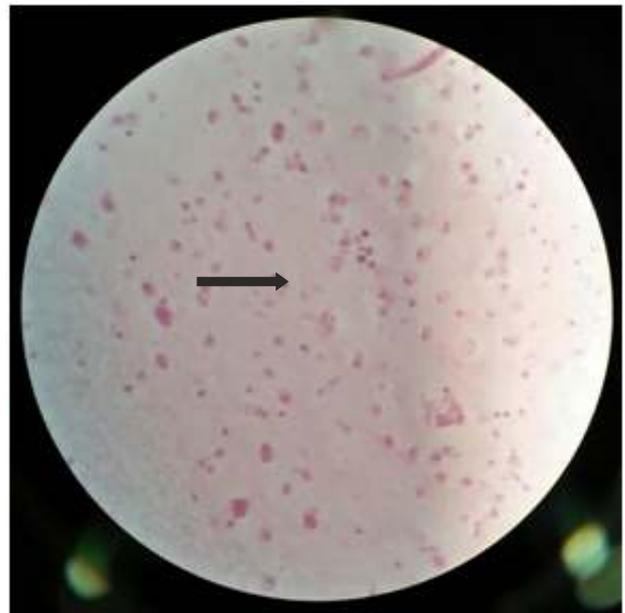
Immediately after excision of Mucocele



Histopathology- Mucin filled space



Excised tissue for histopathology



Mucinophages



Post-operative after 15 days

### Discussion

Mucocele is the second most common lesion in the oral cavity followed by irritational fibroma. The lesions occur more commonly in children and young adults with equal gender distribution.<sup>7</sup> Mucoceles appear as dome-shaped mucosal swellings with the characteristic accumulation of mucin. These lesions usually impart bluish, transparent hue of variable size from 1-2 mm to several centimetres in dimension.<sup>3,8</sup> Lower lip is the most common site of occurrence followed by buccal mucosa and floor of mouth.<sup>9</sup>

An analysis of 36 children by Nico et al in 2008 revealed that 30 out of 36 mucoceles were present on the lower

lip. Depending upon the size and location of mucoceles, the various clinical features include external swelling and interference with mastication, swallowing, and speech and discomfort might occur.<sup>7</sup>

Histopathologic examination of mucocele often reveals formation of well-circumscribed, cyst-like space surrounded by granulation tissue and the presence of mucinophages in the collapsed wall of granulation tissue.<sup>10</sup>

The adjacent salivary gland tissue should also be present because mucocele should always be removed along with feeder glands/ducts which minimize recurrence of the lesion. There are various treatment aspects available for the management of mucocele: scalpel incision, complete surgical excision, marsupialization, micro-marsupialization, intralesional injections of corticosteroids, cryosurgery, laser ablation, sclerosing agent, and electrocautery method.<sup>8</sup>

The main advantages of soft tissue laser application are minimal intraoperative bleeding and swelling and postoperative pain and very less surgical time, scarring, and coagulation, without any need of suturing after excision because of natural wound dressing due to denatured proteins.

The present case was performed by using 940nm in which excellent hemostasis can be achieved due to good affinity for pigments like haemoglobin.<sup>11,12,13</sup>

## Conclusion

This case report reveals knowledge about using diode laser for the treatment of mucocele with minimal anesthesia, less procedural timings, good surgical site visualization, hemostasis, and minimal carbonization in 15 days of periodical follow-up. Patient showed uneventful healing without intraoperative and postoperative complications.

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# MODIFIED CORONALLY ADVANCED FLAP TECHNIQUE FOR THE TREATMENT OF MULTIPLE RESSION DEFECTS – A CASE REPORT

## Abstract

When multiple recession defects affecting adjacent teeth in aesthetic areas of the mouth are present, patient related considerations suggest the selection of the surgical techniques that allow all gingival defects to be simultaneously corrected with the soft tissue close to the defects themselves. The present case report highlights the effectiveness of Zucchelli's modified coronally advanced flap with envelope technique for the treatment of multiple recession defects in patients with aesthetics demands.

**Keywords:** gingival recession; root coverage

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## Introduction

Gingival recession can be defined as the location of gingival margin apical to cemento-enamel junction.<sup>1</sup> Aesthetics is the primary indication for root coverage surgical procedures.<sup>2</sup> In patients with an aesthetic request, the most important outcome is the percentage of complete root coverage, i.e, the proportion of treated defects with the soft tissue margin at the level of or coronal to cemento-enamel junction (CEJ).<sup>3</sup> The coronally advanced flap is the first choice in patients with high aesthetic expectations, when there is adequate keratinized tissue apical to the root exposure. With this approach, the soft tissue used to cover the root exposure is similar in color, texture, and thickness to that originally present at the buccal aspect of the tooth with the recession defect; thus, the aesthetic result is more satisfactory. Multiple gingival recessions, affecting aesthetic areas of the mouth, were successfully treated with an envelope type of coronally advanced flap. The presumed advantage of the envelope type of flap is the lack of vertical releasing incisions, which could damage the lateral blood supply to the flap and might result in unaesthetic visible white scars (keloids).<sup>4,5</sup> This case report describes Zucchelli's modified coronally advanced flap with envelope technique with oblique incision for the treatment of multiple recession defects in patients with aesthetics demands.

## Case Report

A 27 year old male patient reported to the department of periodontology, with a chief complaint of poor esthetics due to receded gums in the lower front region of the jaw with no relevant medical history. On clinical examination, Miller's class I recession was evident with 31, 32, 41 and 42 [Fig. 1A], with recession depth and width of 2-3 mm approximately [Fig: 1B]. The periodontium was healthy with no signs of inflammation. At first visit after recording case history of the patient and routine investigations, thorough scaling and root planing was performed. After 15 days root coverage with modified Zucchelli's coronally advanced flap was planned and informed consent was obtained from the patient.



Fig. 1A. Pre Operative Photograph



Fig. 1B : Depth - 3mm, Width - 2mm

### Surgical Procedure

Zucchelli's technique: Modification of coronally advanced flap for multiple teeth recession coverage.<sup>6</sup> Clinical features of Zucchelli's technique are the absence of vertical releasing incisions, a variable thickness, combining areas of split and full thickness and the coronal repositioning of the flap. Another characteristic feature is the submarginal oblique incisions in the interdental area. Incisions are given obliquely connecting the CEJ of one tooth to the gingival margin of the adjacent tooth. The procedure was carried out under local anesthesia (lignocaine HCL with 2% epinephrine 1 : 200,000). The horizontal incision of the envelope flap consisted of oblique submarginal incisions in the interdental areas, incisions which continued as intrasulcular incisions at the recession defects [Fig. 2]. The envelope was raised with a split-full-split approach in the coronal-apical direction: the oblique interdental incisions were carried out keeping the blade parallel to the long axis of the teeth in order to dissect in a split- thickness manner the surgical papilla. Gingival tissue apical to the exposure was raised in a full-thickness manner to provide that portion of the flap critical for root coverage with more thickness. Finally the most apical portion of the flap was elevated in a split-thickness manner to facilitate the coronal displacement of the flap. [Fig. 3] The root surfaces were planed with the use of curettes. The remaining tissue of the anatomic interdental papillae was de-epithelized to create connective tissue beds to which the surgical papilla were sutured. To avoid the tension while advancing the flap coronally, the frenotomy was performed i.r.t mandibular labial frenum thereafter surgical papillae were rotated towards the ends of the flap and were displaced on the prepared connective tissue beds of the anatomical papillae. The flap was secured in place with interrupted sutures. [Fig.4] This ensured precise adaptation of the flap. The surgical site was then covered with periodontal dressing (coe-pak). [Fig.5]



Fig. 2 : Submarginal Oblique Incisions



Fig. 3 : Split- Full-Split Thickness Flap and De-epithilization of Anatomic Papillae



Fig. 4 : Coronal Mobilization and Suturing



Fig. 5 : Coe-Pak Placement



Fig. 6 : Post-Operative After 15 Days

### Post Operative Care

The Patient was instructed not to remove the pack or disturb the surgical site in any way till the sutures were removed and was also instructed not to brush the teeth in the treated area but to rinse the mouth with chlorhexidine solution (0.12%) twice daily for 1 minute. Patient was advised to take antibiotics and analgesic for 3 days postoperatively. 7 days post operatively the periodontal dressing and the sutures were removed. Healing was satisfactory and adequate root coverage was obtained. Recall after 15 days and 1 month revealed stable results with excellent tissue contour, color match and increase of keratinized tissue. [Fig.7]

### Discussion

Treatment of gingival recessions has become an important therapeutic issue due to the increasing number of cosmetic requests from patients. Patients aesthetic demands, due to the exposure, during smiling or function, of portions of the root surface are the main indication for root coverage surgical procedures.<sup>5</sup> Another factor to be considered is that gingival recession is very seldom localized to a single tooth. More frequently, gingival recession affect groups of adjacent teeth. In order to minimize the number of surgeries and to optimize the aesthetic result, all the contiguous recessions should be treated at the same time. The coronally advanced flap procedure has been demonstrated to be a reliable and predictable treatment modality for obtaining root coverage in isolated types of gingival recessions.<sup>7,8</sup> In the present case report, a new approach to the coronally advanced flap was used to treat multiple recession defects affecting adjacent teeth in patients with aesthetic demands. In the envelope type of flap, vertical releasing incisions are avoided so as not to damage the blood supply to the flap; this is of paramount importance in root coverage procedures where the stability of the root coverage procedures where the stability of the surgical margin is critical to the success of the surgery. Furthermore, vertical releasing incisions often result (after healing) in unaesthetic, visible white scars which can be more

unsatisfactory for the patient than the root exposure itself. Other advantages are derived from the split- full-split flap elevation. In fact, more thickness (and thus better opportunity to achieve root coverage) is provided for that portion of the flap residing over the previously exposed root exposures; it facilitates the coronal displacement of the flap; and it guarantees anchorage and blood supply to the surgical papilla in the interproximal areas between the root exposures.<sup>5</sup> The present case report demonstrated that the proposed modification of the coronally advanced flap is an effective treatment modality for the management of multiple recession defects affecting adjacent teeth in aesthetic regions of the mouth both in terms of root coverage and increase in keratinized tissue.

### Conclusion

The results of the present case demonstrated that this new approach to the coronally advanced flap technique was very effective for the treatment of multiple gingival recessions in patients with esthetics demands both in terms of root coverage and increase in keratinized tissue.

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Sd/-

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