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Is Designing Wardrobes a Micrograph of Applying for Ph.D. Abroad?

DATTATREYA MUKHERJEE¹ , CHRISTOS TSAGKARIS² 

As MBBS students, we always keep an eye on the current trends and opportunities for postgraduate education. Having grown up as social media juggernauts, we tend to begin experimenting with social and professional networking platforms like LinkedIn, Twitter, YouTube as soon as we land on undergraduate studies. As time passes, we either interact directly with academics and researchers in these platforms or get to know the stories, the aspirations and the struggles of current postgraduate students. From this experience, it seems that finding the Ph.D. supervisor and the program you want to pursue has much in common with designing our clothes inside our wardrobes. In a word, it is a time-consuming kind of work, full of repetitions but it increases the chance of acceptability. In a similar manner, maintaining a well-rounded wardrobe increases the chances of getting the right dress in the right time.

What is the most common way to organize your wardrobes? First take out all your dresses. Then short out your dresses which you want to keep and which you want to donate. After that, wash your cloths and then seat for the final designing the wardrobes. There are many ways you can design. Summer clothes, winter clothes or House Clothes, Professional Cloths, Party Clothes or Colour wise like all red clothes, all blue clothes. You can design it according to your convenience. Then place the clothes in the wardrobes. You put all your daily clothes in upper rack, rarely used clothes in lower rack. And yes, you have to change this design according to your convenience. And networking is very important. Like if you put your suits in the corner, you have to put your ties there. So, let's do the naming now. Your all clothes are Research Databases such as PhDportal.eu. Now the priorities while shorting out is your subject interest, your master's thesis and your previous lab experiences. You have to make a list of all supervisors whom you are going to apply. For this you need to go through their profile and research works, papers,

current projects etc. Eventually, a specific amount of clothes will be put in the wardrobes. Now the challenge is how to put the clothes in the right way in the wardrobes. Making an excel spreadsheet may not be common for clothing, but it is a common practice in academia. Make headings with the gross and subheadings with the potential supervisors conducting research in each of these topics. For instance, if you are interested in CAR T cell therapy in Oncology, Cancer Vaccines and Stem cell Therapy in Oncology, make these top headings. Then do list all the supervisors who are working on CART cell therapy in Oncology. Then draft letter of motivations, but make sure you maintain some blank space for the experience, the publications or just the additional motivation you will get by the time of the application.

Letters addressing researchers in the same field can have much in common, however, personalization is the key. It indicates particular interest rather than desperate seeking for a place in postgraduate education. Other documents such as the CV can be the same for all or most of applications, saving a lot of time during the application process. In particular, CV, depending on the requirements of the program, can be as concise and striking as possible. It would be wise for example to mention the number of publications per database and provide a hyperlink proving your claim. Being concise and straightforward is a proof of your skills and it can increase the acceptability in less time. The rest of the time one can use in preparation of IELTS/TOEFL or GRE.

Applying for Ph.D.:

1. Electing the field and the type of your studies is the second phase, is the first influence you might have on your studies, being called to require one amongst individual and structural doctoral programmes for your doctoral studies. This is a compulsory stair in advance for your application for the university admission.¹

2. Prior to candidacy, you must pass certain courses and qualifying examinations that usually consist of both written and oral components (IELTS/TOEFL).²
3. Network well! Attend as many conferences as you can and try to strike meaningful conversations with potential supervisors. All the schools I applied to accepted my application probably because I had strong research proposals which I came up with after discussing with the respective supervisors.³
4. Email to the Professors, don't send same letter of motivations to everyone. Modify as mentioned before in the paper.
5. And, wait for the interview and acceptance.

Apologize, if we are wrong anywhere. The world, both the real and the virtual one, is full of unique Ph.D. stories. The authors, having a background in healthcare and life sciences and being in the doorsteps of this world have put their effort in summarizing the most common challenges and strategies deployed by Ph.D. candidates worldwide, although certain aspects may be different across countries and fields of research. Designing a wardrobe has in our opinion may similarities with this process and it can be relatable to the experience of most people worldwide. Learning from the experience of others is important but nothing is more difficult, and therefore more precious, than the ability to decide on the basis of facts and vision.

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Dental and Oral Care Under Clouds of COVID-19

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Coronavirus (SARS-CoV-2) made the headlines after its initial breakout in Wuhan, China in December 2019. Viral by genome, lethal by nature, strongly contagious by character, it succeeded in making a new chapter in everyone's life in a very short span making it a pandemic. Despite the extensive efforts to limit its effects we stand at a point where more than 50 million people have lost their lives battling COVID. Its widespread growth has raised many concerns for global health, particularly health professionals and dentists precisely. As dentists are more prone to get affected in the course of their occupation, this review is an attempt to briefly summarize the virus and various protocols to be practiced by the dentists in their practices to protect their own health.

KEYWORDS: COVID-19, Dental Practice, Infection Control

BACKGROUND

No one could have imagined that the end of the year 2019 will witness the historic birth of one of the most deadly, an abstruse virus, the severe acute respiratory syndrome coronavirus (SARS-CoV-2). COVID-19 which has strangulated the world by spreading its tentacles in all spheres of life within no time, initiated as a pneumonia outbreak in Wuhan, China. Before anyone could have understood the virus WHO declared it as pandemic emergency on 11th March 2020 involving more than 216 countries in the world.¹

Lethality of this virus can be envisioned as statistical figures are strongly petrifying. Till mid-January 2021, this pandemic has affected over 95 million people and resulted in 52 million confirmed deaths worldwide out of which India still holding a second position after United States with over 10 million confirmed cases and 1,50,000 confirmed deaths which is increasing everyday with an average of 0.12%.² Dental specialists will have to ensure stringent infection prevention and control to prevent its nosocomial spread. This article is aimed to provide a brief overview of this virus and to minimize its spread in dental office.

INTRODUCTION

The SARS-Cov-2, previously named 2019-novel coronavirus by the World Health Organization (WHO), is a beta-coronavirus containing an enveloped, non-segmented, positive-sense RNA genome with high rates of mutation and recombination.³ Initially, it started as a zoonotic

infection, followed by human-to-human transmission. SARS-CoV-2 uses angiotensin-converting enzyme (ACE-2) which is found in the lower respiratory tract as its entry receptor. It is transmitted through both microdroplets due to direct proximity (a distance less than 2 metres and an exposure duration greater than 15 minutes) and core droplets that remain suspended in aerosol. Its transmission has been mainly described through inhalation/ingestion/direct mucous contact with saliva droplets with the incubation period ranging from 5 to 14 days.⁴ It is necessary to establish a clinical protocol to be applied in the working environment to avoid new infections and progressive virus spread. The sudden spread of SARS-CoV-2 has determined the need to modify both preventive and therapeutic protocols in dental practice.⁵

Presently patients are trepidated from disclosing the past medical history to clinicians particularly related to the COVID which could be due to many attributable factors including fear of getting isolated and quarantined as per government protocols, fear of postponing of their dental treatment and one section of the society even take it as social stigma too. Therefore, the safety of the dentist cannot be risked at the will of the patient.

PRE- TREATMENT PROTOCOLS

First and foremost a step towards this is teledentistry which includes telescreening, triage, and



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teleconsulting. If physical presence of the patient is unavoidable in the clinic only then patient should be called on pre-booked appointment.⁶ Before allowing any patient into the dental office, his/her temperature and vitals including oxygen saturation must be recorded and patients should be made to sit in the waiting area with social distancing following the protocols and patient should be provided with the minimum 70% ethanol-based hand sanitizer, disposable head cap, face mask, hand gloves, shoe cover and disposable patient gown.

The clinic staff shall be equipped with personal protective kits (PPE) and should start the screening after donning of all the particulars of the kit including double disposable gloves, surgical head cap, eye shield, N 95 mask, face shield, shoe covers and overall protective gown.⁷ The European Standard classifies filtering facepiece respirators (FFP) into three categories: FFP₁, FFP₂ and FFP₃ with minimum filtration efficiencies of 80%, 94%, and 99%. Consequently, FFP₂ respirators are recommended for use in the prevention of airborne infectious diseases⁸ as they are approximately equivalent to N95.

INTRA TREATMENT PROTOCOLS

Detailed medical history regarding the symptoms of COVID-19 (fever, cough and/or shortness of breath, sore throat, runny nose, diarrhea, lethargy discoloration of fingers or toes, rash of skin, and loss of taste and smell) must be investigated for every single patient and COVID testing should be advised if any positive symptomatic history is observed. Isolation room with negative pressure should be allocated for treatment of any suspected COVID-19 patients to minimize the exposure of patients and staff and an additional application of a portable high-efficiency particulate air (HEPA) filter may be considered.^{9,10}

Aerosol production must be reduced for all patients and every patient should be considered carrier and the use of 3-way syringes, high-speed handpieces, and ultrasonic scalers must be avoided as far as possible. To prevent debris and fluids getting expelled or aspirated anti-retraction or electric friction grip hand pieces must be used with rubber dam. Aerosol production can be minimized by low- or high-volume suction. In radiography, extra oral radiography is favoured over intraoral techniques to reduce saliva production and gag reflex.¹¹

POST-TREATMENT PROTOCOLS

Instruments should be cleaned, disinfected, and sterilized, while all disposables should be presumed to be infected and discarded appropriately. Ethanol, 0.1 and 0.5% sodium hypochlorite, and glutaraldehyde can be used as they decrease coronavirus infectivity and Hydrogen peroxide vaporizer can be utilized for operatory decontamination.¹²

CONCLUSION

As events are unfolding rapidly all dental practitioners should be abreast with the latest news and guidelines. This narrative review has some limitations. As this is a current emergency, in the literature there is a limited and heterogenous number of primary sources directly related to the repercussion of SARS-CoV-2 on the dental discipline. Further studies are needed in the future.

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Coronavirus Disease 2019 (COVID-19): Future Challenges and Recommendations for Dental Settings

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The novel coronavirus outbreak is a contagious disease affecting the countries around the world. The quick advancing nature of pandemic has gripped the entire community making it a public health emergency. Infection control preventive measures are necessary to prevent it from further spreading. Medical practitioners, health care workers and Dentists are at high risk of acquiring and transmission of infection. The virus transmission occurs through respiratory tract, aerosols and droplets. Clinical manifestations of virus vary from mild to severe sickness. This review article mainly emphasizes on all the information collected to date on the virus, and future recommendations for dental settings to manage the further spread of this virus.

KEYWORDS: Coronavirus, Covid-19, Transmission, Infection Control

INTRODUCTION

A novel coronavirus Covid-19 pandemic has emerged as emergency public health crisis across the world. On 30th January 2020, it was declared as community health emergency of international concern, with high risk to many countries.¹ The emergence of first case was found in Wuhan city, China in December. COVID-19 is also known as SARS Cov-2. Coronavirus are single stranded RNA genome with virus evolved around. The virus is found in nasopharyngeal secretions and salivary secretions of the affected patients.

Due to the widespread transmission of this virus, healthcare workers, dentists are at increased risk of contamination, being the potential carriers for the disease.² Dental health care personnel are at very high risk as dentist deal with proximity to the mouth of the patient. Dental setups are more prone to risk of infection due to aerosol production. Therefore, this article emphasizes the upcoming challenges and recommendations for dental setups.

WHAT IS COVID-19?

Recent studies have reported that Coronavirus is similar to Severe Acute respiratory Syndrome and Middle east Respiratory syndrome. But it has been reported that SARSCov-2 has its origin from Chinese horseshoe bats. It affects mainly upper respiratory tract system in humans.³ Its structure resembles to crown like appearance when viewed under electron microscope. It is positive stranded RNA virus with 60-140 nm, spherical in shape.

MODE OF TRANSMISSION

The possible mode of transmission is mainly respiratory droplets, airborne contact, aerosol transmission, close contact with the patient. However the risk of vertical transmission (from mother to fetus) is yet to be confirmed.⁴

SOURCE OF TRANSMISSION

It has been noticed that symptomatic patients as well as asymptomatic patients are the carriers for transmission of disease. Some of the studies suggested that there is human to human transmission.¹ It has been found that person to person transmission occurs via respiratory droplets (airborne spread).

INCUBATION PERIOD

The average incubation period of covid-19 virus varies from 0 to 14 days. The chances of transmission of virus has raised currently in asymptomatic individuals, so duration of medical observation and quarantine ranges to 14 days in case of any history of travel or contact with exposed patients.⁵

HIGH RISK OF ACQUIRING INFECTION

People who are at high risk of acquiring infection are generally health care workers including dentists. All age groups are susceptible but people who are at old age, immunocompromised patients, cardiovascular diseases are at more risk with poor prognosis.

CLINICAL PRESENTATION

The most common symptoms of COVID-19 virus



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include fever, cough, fatigue, shortness of breath whereas less common symptoms are headache, diarrhoea, vomiting. Some of the studies revealed that CT tomography revealed bilateral pneumonia, with ground glass opacity.⁵

ORAL MANIFESTATIONS

The CDC has suggested that loss of sensation/taste is an early symptom of COVID-19. Other manifestations include ulcerations, xerostomia, fungal infections, gingivitis.

COVID-19 AND SALIVA

The most effective and common way for diagnostic confirmation from the individuals is collection of throat swab.¹ Though, this effects the eosophageal lining by inducing bleeding and also sometimes cause coughing which may lead to higher risk incidence for health care workers or professionals. So, now a days collection of saliva is also a preferred method and is more acceptable as it is not invasive and reduces the risk of transmission to health care workers.² Saliva from the suspected individuals can be collected by saliva swabs or directly from salivary gland duct. Thus, saliva also plays a major role in collection of the sample for the diagnostic purpose.

INFECTION CONTROL & RECOMMENDATIONS FOR THE CONTROL OF SPREAD OF COVID 19

There are many protocols and preventive measures that are given by the DCI to control the spread of Covid 19 Virus.¹ The Dental Council of India has divided the protocols and control measures into three different phases:

Phase I: Preparatory phase for a dental clinic:

FOR DOCTORS & HEALTH CARE WORKERS

Hydroxychloroquine Prophylaxis: All the healthcare workers who were involved in treatment or contact of asymptomatic or confirmed cases of Covid -19 are advised to go for hydroxychloroquine prophylaxis.

Training of the Health Care Workers: All the members working in hospitals, operatory areas or dental clinics are advised to maintain social distance and use masks.⁶ Not only this, they should also make

sure all the other members entering the clinic premises should follow the rules of social distancing and must wear masks.

- Health care workers should always choose the proper PPE kit.
- The working rotation hours or the intervals to work in the operatory area should be more frequent. One should not be posted for long working hours to prevent fatigue and tiredness.
- Personal clothing should be avoided and all surgical attires should be worn.

DONNING & DOFFING OF PPE (Figure 1)

DONNING OF PPE

- Remove any accessories that you are wearing like watches, jewellery, rings etc.
- Use washroom before donning.
- Wear glasses after wearing the surgical N95 mask.

DOFFING OF PPE (Figure 1)

FOR PATIENTS AND PATIENT'S ASSISTANTS

All should be encouraged to wear masks and follow the instructions of social distancing.

Touching the surfaces and holding onto the railings should be avoided.

THE OPERATORY AREA AND WAITING AREA

1. Clinic entrance, waiting area and reception: At the reception area plastic or glass barriers should be installed.⁷ Cashless or contactless payment methods should be preferred. Posters can be used to alert the patients about coughing etiquettes, respiratory hygiene and social distancing.

2. Changing room: Should be provided for donning and doffing of PPE kits and also for changing clothes.

3. Area for sterilization: An assistant should be assigned for proper sterilization and packing of the instruments. He should also make sure sufficient availability of PPE kits and their proper storage.

4. Washrooms: Sensor taps should be used. Instead of using towels, paper towels or tissue papers should be used.

5. Dental clinic: Surfaces should be cleaned after every visit of the patient and also proper sterilization of instruments used in the operatory area should be done. In the areas of centralized ACs, return air vents should be blocked and also the windows and doors

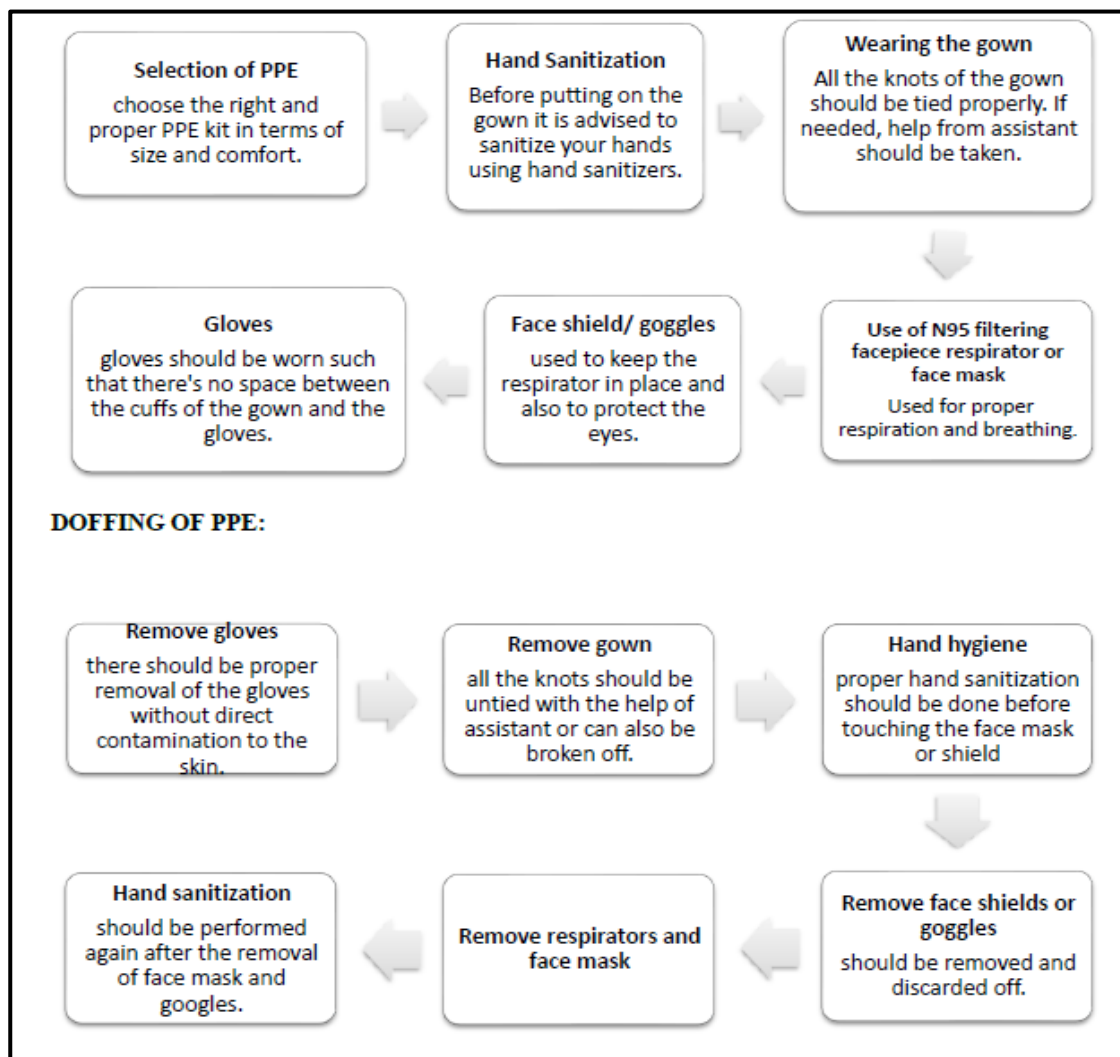


Figure 1. Procedure for Donning and Doffing of PPE

should be kept slightly open to ensure ventilation. Indoor portable air cleaning system should be used along with HEPA filters.

6. Environment and surface disinfection: Floors should be disinfected by 1% sodium hypochlorite. Electronic instruments should be wiped with alcohol based rub/sprit

Phase II: Implementation phase

Teleconsultation tele-screening: Screening using telephonic communication should be encouraged and also installation of Arogya setu app should be made mandatory.⁸

Dental history and remote triage: Screening and consultations can also be done using mobile apps. Only the pre-appointed patients should be allowed to enter the clinic areas until and unless there's case of emergency.⁹

Patient handling: Non- aerosol generating procedures should be encouraged along with the use of rubber dams. Proper precautions with use of face masks and PPE kits should be encouraged. All infection control measures should be taken and it is also advisable to use 4-handed technique during operative procedures.⁷

Patient discharge protocol: Drape of the patient should be removed by the assistant and should be discarded with proper care. Patient should be provided with all the follow up instructions and also instructed to perform hand sanitization.¹⁰

Disinfection protocols: All the used instruments should be immediately rinsed in running water and repeatedly touched surfaces like three way syringes, water outlets should be flushed using disinfectant solution. Hand piece should be cleaned using hand piece cleaning solutions. Floors and chairs should be cleaned.¹¹

CLINIC CLOSURE PROTOCOLS

Fogging: 'No touch surface disinfection' The commercially available hydrogen peroxide is 11% (w/v) solution which is stabilized by 0.01% of silver nitrate. A 20% working solution should be prepared. The volume of working solution required for fogging is approximately 1000 ml per 1000 cubic feet. After the procedure has been completed in the operatory (in case of no negative pressure), exit the room and close the operatory for half hour for the aerosols/droplets to settle down.⁸ Perform the 2 Step surface cleaning followed by fogging. The fogging time is usually 45 minutes followed by contact time/dwell time of one hour. After that the room can be opened, fans can be switched on for aeration. Wet surfaces can be dried/cleaned by using a sterile cloth or clean cloth.

Protocol for health care workers on reaching home: On reaching home the shoes should be removed, clothes should be changed, mobile wristwatch etc. should be disinfected.

Phase III: Patient follow up & review

The patients should be communicated using phone calls within next 24 hours and also in next week to make sure they have developed any symptoms so that the health care workers can take required measures.¹²

CONCLUSION

Coronavirus has given dentists a new challenge to deal with the patients. Transmission of virus in dental environment usually occurs through aerosol, droplets.¹³ Dentists should be aware about the new information about the disease. Teledentistry is found to be effective in reducing the risk of infection. It is of utmost responsibility of every health care professional to strictly implement infection control protocol to

combat the future challenges and further spread of infection.

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Intentional Replantation: A Last Resort for Treatment of Periodontally Hopeless Teeth

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Periodontal disease is an inflammatory response to the bacterial biofilm which leads to inflammation of periodontal structures and further results in loss of attachment and bone loss which in severe cases leads to mobility of teeth, eventually may cause exfoliation of teeth. Treatment option for excessive mobile teeth is extraction and replacement can be carried out with fixed partial denture or implant placement. In patients with financial constraints and also the patients in whom the fixed partial denture is contraindicated, intentional replantation of periodontally hopeless teeth is an alternative treatment modality. It's a procedure of purposely removing a tooth and replacing it in a more apical position. Thus, this procedure of intentional replantation can be considered as an alternative treatment modality rather than extraction of periodontally hopeless teeth.

KEYWORDS: Periodontally Compromised, Replantation, Platelet Rich Fibrin

INTRODUCTION

The periodontal therapy in teeth with advanced bone loss, a significant grade of mobility, tooth migration and elongation; often exposes the dental clinician to a challenging decision when it comes to the effective treatment for the patient.¹ There are various functional problems in the treatment of anterior teeth with periodontal destruction. The treatment of choice for periodontally involved hopeless teeth is usually extraction.²

However, in cases where extrusive luxation is severe and the tooth is highly mobile, extraction is the recommended procedure and replacement of the missing teeth may be done using removable partial denture (RPD), fixed partial denture (FPD) or implant placement. Intentional replantation may be considered as an alternative treatment option in patients who are unable to afford the treatment cost of implants or in cases where FPD is contraindicated.³ Intentional replantation is described as an intervention to purposely remove a tooth and to replace it in its socket following certain extra-oral procedures. Improving the support of periodontal tissue and thereby increasing the survival and functional quality of replanted teeth remains a major concern in cases of periodontally hopeless teeth. In order to enhance the outcomes obtained with intentional reimplantation, supportive treatments have been proposed.⁴

According to many authors, intentional reimplantation is considered as a last resort for

preserving an otherwise missing tooth. Even though intentional reimplantation is contraindicated in periodontally involved teeth in which there is significant mobility of tooth, furcation involvement or inflammation of gingiva, some authors have reported good results after reimplantation of teeth with periodontal involvement.^{5,6}

CASE REPORT

A 35-year-old male patient reported to the Department of Periodontics and Oral Implantology with a chief complaint of increasing gap in between upper front teeth since 8 months giving a bad appearance in the esthetic zone. On clinical examination, pathologically migrated 11,12,21,22 and grade II mobility with 11 was noticed. On probing, pocket depth was 9 mm on the mesial aspect of 11 and 4 mm in the distal and palatal aspect (figure 1). Radiographic examination revealed moderate to severe bone loss in relation to 11.

1. Treatment plan: Patient being middle aged, requested to retain his natural tooth and denied for extraction of the tooth for esthetic concern and also due to financial reasons. Considering the clinical condition, intentional replantation of 11 was scheduled after explaining the advantages and disadvantages of the procedure to the patient. Following the completion of phase I therapy, intentional root canal treatment was done in relation to 11. The reimplantation procedure was planned four weeks after the completion of root canal



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treatment.



Figure 1. Preoperative clinical picture and IOPA

2. Surgical procedure: Extraoral scrub with betadine was applied after which local anesthesia (2% lignocaine HCl with 1:80000 adrenaline) was administered to anaesthetize the surgical area. Tooth was atraumatically extracted (figure 2). Extracted tooth was carefully root planed for removal of necrotic cementum and granulation tissue. It was then placed in a solution of tetracycline (500 mg of tetracycline dissolved in 20 ml saline) for a period of 5 minutes (figure 3).

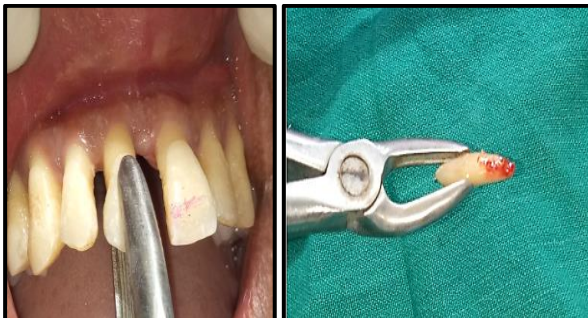


Figure 2. Atraumatically extracted tooth



Figure 3. Tooth placed in tetracycline solution

A total volume of 10 ml blood was withdrawn, which was immediately centrifuged at 3000 rpm for 10 minutes for the preparation of Platelet Rich Fibrin (PRF) following the protocol as recommended by Dohan DM et al.⁷ (figure 4).



Figure 4. Platelet rich fibrin

Using implant drills, the socket was extended apical to its base, with sequential drills till the tooth completely fits into the new socket (figure 5).



Figure 5. Reimplantation site preparation

PRF obtained was placed in the tooth socket and tooth was reinserted in the extraction socket with an attempt to realign it (figure 6).



Figure 6. Placement of PRF and tooth reinserted in the extraction socket

Tooth was splinted with the ligature wire and flowable composite. Splinting was retained for 3 months [figure 7(a)]. Post-operative medications were prescribed that included antibiotics and an analgesic for 5 days. 0.2% chlorhexidine mouthwash was prescribed for 14 days starting from the day following surgery. Post operative instructions were given to the patient to maintain proper oral hygiene. Post operative intra oral radiograph of 11 was taken immediately [figure 7(b)]. Patient was recalled for check-up every week for a month and every 4 weeks then after [figure 8 (a) & (b)].

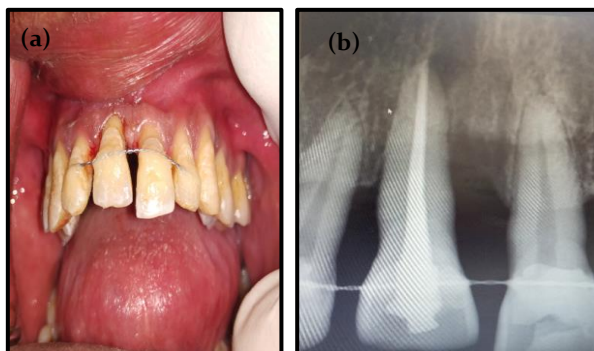


Figure 7 (a). Splinting done and tooth stabilized
Figure 7 (b). Immediate post-operative IOPA

Patient is still under continued supportive periodontal therapy and has not shown any untoward effects of root resorption or mobility.

DISCUSSION

Intentional replantation is often considered as one of the last treatment option for periodontally hopeless teeth.

Some authors have also reported successful results. Baykara and Eratalay (1995) carried out intentional

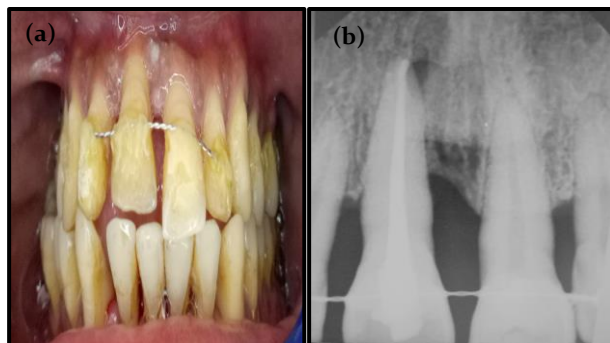


Figure 8 (a). 3 months follow-up
Figure 8 (b). 3 months post-operative: Shows definitive radiopacity in periapical area

replantation of teeth with periodontal involvement and reported successful outcomes for a period of 8 years.⁸ Demiralp et al. (2003) reimplanted periodontally hopeless teeth and obtained good outcomes at 6 months.² Yaprak et al.(2010) performed intentional reimplantation of two maxillary central incisors which were highly mobile due to advanced periodontal involvement and obtained successful results on 4 year follow up.⁹

In the present case, a similar treatment plan was formulated. The present case was followed up for a period of 3 months and is still under continuous follow up. Another option for this procedure could be extraction of central incisor and replacement with a fixed prosthetic including laterals and opposite central. However, this treatment option would be concluded with some outcomes and little expensive treatment alternative for the patient.⁵

In the present case, patient was middle aged and had financial constraints for fixed partial denture or implant therapy. He was willing to save the natural tooth in spite of the informed risks and chances of treatment failure.

The tooth had high grade of mobility in the present case and therefore, the exposed portion of the root would have been devoid of essential PDL cells that can serve as a nidus for infection and thus contribute to external root resorption.

Tetracycline solution is considered to have antibacterial, anti-inflammatory as well as anti-collagenase property and therefore, the tooth was treated with this solution. Studies have reported good outcomes in bone gain and in reduction of

probing pocket depth at the end of 6 months when intentional replantation of periodontally hopeless teeth was performed after treating with tetracycline-HCl.¹⁰

In the present case, a substantial improvement in bone support and reduction in the mobility of tooth has been observed following reimplantation. These findings can be compared to the study done by Demir et al. They carried out intentional reimplantation with PRP, bioactive glass graft material and non-resorbable polytetrafluoroethylene membrane in periodontally hopeless teeth with grade II mobility and obtained a substantial bone formation and reduction in mobility on 12 month follow up.¹⁰

In our case, the bone fill and healing was improved by the advantages of sustained release growth factors that could have contributed to the success of the treatment.

In the present case, prosthetic replacement was not considered due to the financial limitations of the patient.

CONCLUSION

For the tooth with a hopeless prognosis and extensive mobility intentional reimplantation is an alternative treatment. This procedure is relatively conservative and affordable when compared to other treatment modalities used for replacing missing teeth. Therefore, further research and long-term follow-up are required to establish this modality of treatment. The outcome of the case shows increase in longevity of the tooth.

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Effectiveness of Honey and Aloe Vera on the Post Extraction Healing Among Young Adults: A Randomized Clinical Trial

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INTRODUCTION: "Dry socket" was first described by Crawford in literature in 1896. When people are recognizing that current medicine is not the soul cure for diseases, we look back to the past for potential remedies with the least possible side-effectiveness. So the objective of this study was to evaluate the effectiveness of honey and aloe vera on healing of post extraction wounds.

MATERIAL AND METHODS: Honey and aloe-vera were prepared by mixing with sterilized cotton. The socket involved was separated by dry autoclaved cotton rolls from the rest of the oral cavity, then honey/aloe-vera was inserted into the respective groups. All patients were advised to avoid solid and liquid diets for 30 minutes after the treatment. Dressings were changed on 3rd day and on 7th day and sockets were evaluated.

RESULTS: When the intra-group comparison of honey (p-value=0.003) and aloe-vera (p-value=0.000) was done, both were found to be statistically significant in the healing of dry socket. When the inter-group comparison was done between honey and aloe-vera, Aloe-vera had high healing capacity and was found to be highly statistically significant (p-value=0.001).

DISCUSSION: When the intra-group comparison of honey and aloe-vera was done, both were found to be statistically significant in the reduction of dry socket. When the inter-group comparison was done between honey and aloe-vera, Aloe-vera had high healing capacity and was found to be highly statistically significant (p-value=0.00).

CONCLUSION: From the analysis, it can be inferred that aloe vera and honey are healthy, natural and user-friendly substitute adjuncts that might be feasible to promote healing of extraction sockets.

KEYWORDS: Tooth Extraction, Wound Healing, Clinical Trial

INTRODUCTION

"Dry socket" was first described by Crawford in literature in 1896. Since then, other terms have been used to refer to this complication, such as "alveolar osteitis", "alveolitis", "localized osteitis", "alveolitis sicca dolorosa", "localized alveolar osteitis", "fibrinolytic alveolitis", "septic socket", "necrotic socket", and "alveolgia".¹ There is a loss of clot from the socket in this condition. Postoperative clinical discomfort can vary from basic local inflammation to typical alveolar osteitis, including halitosis, regional trismus, empty socket irradiating dull throbbing pain, usually to the ipsilateral ear, temporal zone, or eye. Some of the essential etiological considerations are oral microorganisms, trauma during procedure, root and bone fragments left in the cavity, repeated curettage and irrigation, blood clot dislodging, oral contraceptives and smoking. In normal dental extractions, the incidence of alveolar osteitis has been reported in the range of 0.5 percent-5 percent, but 1 percent-37.5 percent higher incidence of alveolar osteitis is recorded with the extraction of mandibular third molars.²

Every dry socket management technique is considered effective if it increases the patient's quality of life while

lowering the expense of treatment and reducing the patient's pain. Copious irrigation with warm saline or dilute hydrogen peroxide extraction socket and dressing with obtundent medication are some of the known dry socket treatment modality but have their limitations of prolonged and repeated patient visits to complete treatment. The topical application of a mixture of eugenol, benzocaine and Peruvian balsam³, iodoform and butylparaminobenzoate and prophylactic administration of antibiotics containing systemic beta-lactamase inhibitor showed a drop in dry socket incidence.^{4,5}

The use of various natural medicines in the field of dentistry has been supported by recent development and success in the field of alternative medicine. The use of natural products in the prevention and care of oral disorders may be useful for urban and rural populations at a low socioeconomic level. "Honey" & "Aloe vera" are the most common and attracting a lot of scientific attention among the numerous herbal agents currently available.⁶

The honey dry socket philosophy was drawn from fundamental science and clinical study of rapid



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epithelization of tissue injuries, covering the wound with honey retards tissue oxygenation by shielding the injured mucosa from air (oxygen) that would dampen pain within 30 seconds after application.⁷ More recently, about 60 species of bacteria have been documented to be inhibited by honey, including aerobes and anaerobes, gram-positive and gram-negative micro-organisms.⁶

On the other hand, the name Aloe vera is derived from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true.” Aloe vera gel (or mucilage) is a smooth, thin, tasteless, jelly-like substance making up the inner parenchymal tissue component of the aloe leaves. This tissue is retrieved from the leaf by removing the gel from the inner cellular substance.⁶

When people are recognizing that current medicine is not the soul cure for diseases, we look back to the past for potential remedies with the least possible side-effectiveness. So, the objective of this study was to evaluate the effectiveness of honey and aloe vera on healing of post extraction wounds.

MATERIAL AND METHODS

This study was conducted in the Department of Public Health Dentistry in collaboration with Department of Oral Medicine & Radiology and Department Of Oral Surgery. After receiving ethical clearance, twenty dry socket patients were recruited for the research. The clinical criterion for dry socket was based on the following: two or three days of extraction and pain history, clinical assessment for sensitivity on gentle probing, trismus, halitosis and state of the tooth socket, i.e. bare bone and blood clot breakdown.

The research excluded the patients with systemic conditions such as diabetes mellitus, hepatic dysfunction, blood dyscrasia, bleeding problems, prior use of dry socket systemic antibiotics and background of all forms of tobacco use. After explaining the risks and benefits involved with treatment, informed consent was taken from the patients.

It was observed that the dry sockets were filled with food remains, soft plaque, bony flecks, or other residue from the tooth or calculus. The socket was then irrigated completely with normal saline. The bare bone was exposed without any covering of healing granulation tissue. Simple randomization technique

was followed and the patients were divided into two groups.

Group 1: 10 post extraction sockets were treated with honey application.

Group 2: 10 post extraction sockets were treated with aloe-vera application.

Honey and aloe-vera were prepared by mixing with sterilized cotton. The socket involved was separated by dry autoclaved cotton rolls from the rest of the oral cavity, then honey/aloe-vera was inserted into the respective groups. All patients were advised to avoid solid and liquid diets for 30 minutes after the treatment. Dressings were changed on 3rd day and on 7th day and sockets were evaluated.

Healing potential was assessed using the standardised index by Landry, Turnbull and Howley Scores.

Healing Index 1: Very Poor Has 2 or more of the following:

- Tissue color: $\geq 50\%$ of gingiva red
- Response to palpation: bleeding
- granulation tissue: present
- incision margin: not epithelialized, with loss of epithelium beyond incision margin
- suppuration present

Healing Index 2: Poor

- tissue color: $\geq 50\%$ of gingiva red
- response to palpation: bleeding
- granulation tissue: present
- incision margin: not epithelialized, with connective tissue exposed

Healing Index 3: Good

- tissue color: $\geq 25\%$ and $< 50\%$ of gingiva red
- response to palpation: no bleeding
- granulation tissue: none
- incision margin: no connective tissue exposed

Healing Index 4: Very Good

- tissue color: $< 25\%$ of gingiva red
- response to palpation: no bleeding
- granulation tissue: none
- incision margin: no connective tissue exposed

Healing Index 5: Excellent

- tissue color: all tissues pink
- response to palpation: no bleeding
- granulation tissue: none
- incision margin: no connective tissue exposed⁷

Statistical analysis: The data was entered on the Microsoft Excel spreadsheet and imported for statistical analysis into the Statistical Package for Social Sciences (SPSS) version 22. Significant differences were observed by applying the paired-t test and Independent t-test. Statistical significance was set at P-value less than 0.05.

RESULTS:

In the present study, 20 patients were selected in which 10 were males and 10 were females (table 1).

Total number of Patients		
Gender	Number	Total
Male	10	20
Female	10	

Table 1. Distribution of study subjects

There were twelve patients who complained of pain, five patients had necrotic slough and three patients had halitosis (table 2).

Clinical symptoms		
S.no.	Symptom	No. of Patients
1	Pain	12
2	Necrotic slough	5
3	Halitosis	3

Table 2. Clinical symptoms study subjects

Among the 20 teeth, only six teeth were maxillary molars (Four Maxillary Right Third Molar, Two Maxillary Left Third Molar) and the rest of 14 teeth were mandibular molars (Six Mandibular Left Third Molar, Eight Mandibular Right Third Molar, table 3).

Tooth number	Frequency
1. Maxillary Right Third Molar	4
2. Maxillary Left Third Molar	2
3. Mandibular Left Third Molar	6
4. Mandibular Right Third Molar	8

Table 3. Distribution of the teeth involved in the study

When the intra-group comparison of honey (p-value=0.003) and aloe-vera (p-value=0.000) was done, both were found to be statistically significant in the healing of dry socket (table4).

INTRA GROUP COMPARISONS			
Visit	Mean ±S.D	t-Value	p-Value
Group A (Honey) Mean ± SD	1.0±0.5	-3.7	0.003*
Group B (ALOE VERA) Mean ± SD	3.7±0.4	-35.194	0.000*

Table 4. Intra-group comparison of honey (p-value=0.003) and aloe-vera. [Paired t-test; p-value ≤ 0.05 (statistically significant)]

When the inter-group comparison was done between honey and aloe-vera, Aloe-vera had high healing capacity and was found to be highly statistically significant (p-value=0.001, table 5).

DISCUSSION

During dentoalveolar surgery, the appearance of dry sockets are common. This develops during the healing process of extraction socket which is most common following complicated extractions. The dry socket results in the extraction socket's delayed wound healing and its aetiology is not apparent. It is thought to arise because of the elevated degree of fibrinolytic involvement in the extraction socket, resulting in blood clot lysis, resulting in bone exposure. Dry socket pain occurs due to the release of kinins readily accessible during tissue damage, sensitivity to nerve endings to air, food and fluids in the extraction socket's bare bone, and an autoimmune mechanism that produces pain mediators and tissue activators. Because of more vascularization of maxilla than mandible, dry socket is more frequent in mandible than maxilla. Molars are often more affected because their sockets have broader circumferences that contribute to greater blood clots than other teeth that are likely to expose the blood clots to more fibrinolytic action.¹

In folk medicine, herbal ingredients have been used for many years. Honey has an active antibacterial ability to cure periodontal diseases and mouth ulcers by fighting oral infections. Honey was used to heal contaminated wounds as long ago as 2000 years before bacteria were found to be the cause of infection. Honey was identified by Dioscorides in 50 AD as being good for all rotten and hollow ulcers. Honey has been reported to have an inhibitory effect on about 60 species of bacteria, including aerobes and anaerobes, gram-positive and gram-negative microorganisms.⁸ Antibiotic resistant strains of bacteria (MRSA and VRE) have been found to

Visit	Group A (Honey) Mean ± SD	Group B (ALOE VERA) Mean ± SD	t-Value	p-Value
1 st day Visit	1.5 ± 0.5	1.3 ± 0.4	1.2	0.206
3 rd day Visit	3.1 ± 0.55	3.3 ± 1.0	-0.9	0.350
7 th day Visit	4.3± 0.8	4.0 ± 0.1	-3.9	0.001*

Table 5. Inter-group comparison of honey (p-value=0.003) and aloe-vera. [Independent t-test; p-value ≤ 0.05 (statistically significant)]

be just as sensitive to honey as the antibiotic sensitive strains of the same species⁹, and there have been clinical records of wounds contaminated with MRSA being healed of infection and cured by application of honey.^{10,11,12} Hassan S et al.² conducted a study in which honey was found to be significantly effective in the healing of dry socket.

The aloe vera plant has been known and used for decades for its medicinal and skin care properties. The name Aloe vera is derived from the word "Alloeh" in Arabic, meaning sparkling bitter material, while "vera" means true in Latin. Aloe vera was used as the universal panacea by Greek scientists. Use of aloe-vera as a herbal remedy in dental conditions is increasing because of its proven anti-inflammatory, antiviral, antibacterial and antioxidative effects.¹³ The healing ability of aloe vera can be due to a variety of reasons, but the three important factors are:

1. Pain & inflammation Inhibition.
2. Fibroblasts Stimulation to functionally produce proteoglycans & collagen
3. Increase the tensile strength of the wound¹⁴

The fibroblast stimulation of Aloe vera produces and contributes additional collagen to the tissue during the healing process. Macrophages can also secrete substances which can activate fibroblasts in a similar way. New collagen forms between the margins of wounds when Aloe is present, whether the effect is direct (from Aloe) or indirect (from microphages). The improved tensile strength is mainly attributed to these collagen bonds. Thus, if the tensile strength increases, it is believed that Aloe increases the development of collagen.

Aloe vera gel contains a glycoprotein with cell proliferating-promoting activity and it has also been

noted that aloe vera gel improved wound healing by increasing blood supply, which in turn resulted in increased oxygenation. Thompson reported in 1991 that topical use of allantoin gel extracted from aloe vera promoted the activity of fibroblasts and the proliferation of collagen.¹⁵

In the current study, 20 patients were selected in which 10 were males and 10 were females. Among the 20 teeth, only six teeth were maxillary molars (Four Maxillary Right Third Molar, Two Maxillary Left Third Molar) and the rest (14 teeth) were mandibular molars (Six Mandibular Left Third Molars, Eight Mandibular Right Third Molars).

When the intra-group comparison of honey and aloe-vera was done, both were found to be statistically significant in the reduction of dry socket which was in accordance to Hassan S et al.², Ansari A et al.¹⁶ (for honey); Hemlatha R et al.⁶, Syafilda et al.¹⁷ and Nimma LV et al. (for aloe-vera).¹⁸

However when the inter-group comparison was done between honey and aloe-vera, Aloe-vera had high healing capacity and was found to be highly statistically significant (p-value=0.001). A study by Hemalatha R et al.⁶, who compared Aloe vera and honey on the post extraction wounds have used both drugs together implicating the importance of these herbs with no much clarity between the efficacy of Aloe vera or honey playing important role in healing.

Limitations of the study:

- We could show better results if we increase the sample size.
- Review of literature reveals no data on the comparison of honey and aloe vera for the treatment of dry socket.

Therefore, more clinical trials with larger sample size

should be carried out.

CONCLUSION

From the analysis, it can be inferred that aloe vera and honey are healthy, natural and user-friendly substitute adjuncts that might be feasible to promote healing of extraction sockets. In order to ensure efficacy with these therapeutic agents, careful diagnosis, better understanding of herbal medicine and the application of that knowledge in treatment planning are necessary. Thus, herbal medicines will have a very important role in dentistry in times to come.

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Comparative Evaluation of Root Resorption in Correction of Class II Malocclusion

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INTRODUCTION: External apical root resorption is a common iatrogenic side effect of orthodontic treatment and has been reported particularly in anterior teeth. The etiology of resorption is multifactorial, complex and individual susceptibility to resorption depends on various factors.

MATERIALS AND METHOD: The degree of root resorption during orthodontic treatment was evaluated on the post-treatment RVGs of the maxillary and mandibular central and lateral incisors of 28 skeletal Class II patients with mandible retrusion treated with non-extraction treatment protocol using elastics and PowerScope.

RESULTS: There was no statistically significant difference in root resorption between the groups for the overall score and comparison of root resorption in individual teeth between two groups showed significantly more resorption in PowerScope group in mandibular lateral incisors.

CONCLUSION: Both elastic and PowerScope groups showed mostly mild to moderate root resorption which is clinically acceptable and lower lateral incisors showed statistically more root resorption in PowerScope group.

KEYWORDS: Resorption, PowerScope, Malocclusion

INTRODUCTION

Class II malocclusion with mandibular retrusion is one of the major reasons for patients seeking orthodontic treatment.^{1,2} Different treatment modalities are available for its treatment depending upon the age, severity of antero-posterior discrepancy, clinical evaluation, cephalometric hard and soft tissue analysis and patient's compliance etc.³ One of the most widely used techniques to correct Class II malocclusion in growing patients is functional jaw orthopedics through mandibular advancement to stimulate mandibular growth by forward positioning of the mandible.⁴⁻⁶

With the pioneer work of Calvin S Case and Henry A Baker, use of intermaxillary elastics has been a standard procedure for the correction of class II malocclusion.^{7,8} Intermaxillary elastics are effective in treating antero-posterior discrepancy of dentition but undesirable side effects have been reported due to vertical force vector with intermaxillary elastics.⁷⁻⁹ Removable functional appliances have now been replaced by fixed functional appliances to overcome two major limitations of removable appliances- need for patient compliance and longer treatment duration. PowerScope (American orthodontics, USA) a semi-rigid one piece, one size- fit all hybrid fixed appliance was introduced by Andy Hayes.¹⁰ It is simple in design, hygienic, and requires

less inventory, delivering consistent forces than the other fixed functional appliances.¹¹⁻¹³

External apical root resorption is a common iatrogenic side effect of orthodontic treatment and has been reported particularly in anterior teeth. There is more than 90% occurrence of external apical root resorption reported by histological studies and radiographic evaluation studies reported between 48% and 66% occurrence.¹⁴⁻²¹ The etiology of resorption is multifactorial and complex and individual susceptibility to resorption depends on various factors such as tooth root morphology, type of tooth movement, genetics, chronological age, treatment duration and magnitude of applied force etc.²²⁻³⁰

The purpose of this study was to compare the apical root resorption in class II patients with mandible retrusion treated by use of elastics and PowerScope fixed functional appliance as there is no study published in which there is comparison of root resorption between PowerScope and intermaxillary elastics in the treatment of Class II malocclusion.

MATERIALS AND METHOD

The study was conducted in the department of



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Orthodontics and Dentofacial Orthopedics and included 28 skeletal Class II patients with mandible retrusion treated with non-extraction treatment protocol in the age group of 12-16 years. The subjects were randomly allocated into two groups.

The groups were as follows: Elastic group- 14 patients treated with class II elastics and PowerScope group- 14 patients treated with PowerScope appliance.

INCLUSION CRITERIA

1. Patients with skeletal Class II malocclusion, requiring skeletal mandibular sagittal correction
2. Molar relation with a minimum of half the cusp width of Class II molar relationship
3. Treatment completed without any permanent tooth extraction (excluding third molars)
4. Moderately increased overjet
5. Mild to moderately increased overbite
6. Reduced or normal lower facial height
7. Lower dental arch crowding < 3 mm
8. Maxillary midline coincident with the facial midline
9. Positive clinical Visual treatment objective (VTO)
10. No history of any systemic medical illness
11. Good quality pretreatment and post-treatment periapical and pretreatment cephalometric radiographs

EXCLUSION CRITERIA

1. Incompletely formed roots or any sign of root resorption
2. Pretreatment signs and symptoms of temporomandibular joint dysfunction
3. History of trauma
4. Endodontically treated incisors
5. Missing incisors or peg lateral incisors

In both groups patients were treated with 0.022" MBT pre-adjusted edgewise appliance following a usual wire sequence. Maxillary and mandibular arch wires (0.019" X 0.025" SS) were left in place for 6 weeks for complete leveling and alignment in the elastics group, class II elastics of 3/16-inch diameter and 4.5-ounce force on both sides were used for 15-18 hours/day. Elastics extended from the canine hook to the mandibular first molar (figure 1). PowerScope was installed by securing wire attaching nuts to the maxillary and mandibular arch wires, mesial to the first molar in the maxillary arch and distal to the canine in the mandibular arch (figure 2). Activation of the appliance was done by the addition of shims on the pushing rod till it covered the activation black dot on the appliance. A labial root



Figure 1. Intraoral photograph showing class II malocclusion treatment with elastics



Figure 2. Intraoral photograph showing class II malocclusion treatment with PowerScope

torque was placed in the .019 X .025 mandibular arch wire in anterior region so that minimum proclination of the mandibular incisors takes place and wire was cinched distal to the molar tube. Pre and post treatment RVG of maxillary and mandibular incisors were obtained using Acteon Satelec dental RVG unit using sensor positioner (figure 3). The initial and final periapical radiographs were scanned and images were analyzed with Photoshop software (version 7.0; Adobe Systems, San Jose, California) at 300% enlargement, without image quality loss.



Figure 3. Taking RVG of incisors using sensor positioner

The degree of root resorption during orthodontic treatment was evaluated on the post-treatment RVGs of the maxillary and mandibular central and lateral incisors using the score system of Malmgren et al. (figure 4). Signs of apical root resorption were recorded according to 5 scores defined from 0 to 4 with 0, no root resorption; 1, mild resorption, with the root of normal length and only an irregular contour; 2, moderate resorption, with small areas of root loss and the apex having an almost straight contour; 3, severe resorption, with loss of almost one third of root length; and 4, extreme resorption, with loss of more than one third of the root length.



Figure 4. RVG showing root resorption

The pre-treatment cephalometric radiographs were hand traced on cellulose acetate paper, landmarks were identified and a customized cephalometric analysis was done to make a baseline data to compare homogeneity between two groups.

Statistical analysis: A master file was created by entering data into a Microsoft Excel spreadsheet and data were analyzed using SPSS (version 21.0 SPSS, Chicago, Ill). The data were subjected to descriptive analysis for proportion, mean, and standard deviation. Intergroup root resorption was compared with Mann-Whitney U tests, as an overall score for the groups and for each tooth. Descriptive statistics were used to show the tooth distribution among the scores of root resorption according to the method of Malmgren et al.³¹ All statistical tests were performed at the .05 significance level.

RESULTS

The statistical comparison of the mean pre-treatment age, gender distributions (table 1) and baseline data (table 2) showing cephalometric variables did not reveal any significant difference for the two groups

except for treatment time which is more for elastic group.

There was no statistically significant difference in root resorption between the groups for the overall score (table 3) and comparison of root resorption in individual teeth between two groups showed significantly more resorption in PowerScope group in mandibular lateral incisors.

The distributions of teeth in different groups according to 5 scores of root resorption are shown in table 4.

DISCUSSION

External apical root resorption is a common sequel of orthodontic treatment that is associated with many factors. A prospective randomized clinical trial is widely accepted as excellent investigation method avoiding the limitations of design, methodology, treatment characteristics and variables related to patients but there are substantial ethical issues to consider.³² Therefore, in this study, patients with Class II Division 1 malocclusion, with mandibular retrusion treated with Class II elastics and PowerScope fixed functional appliance were consecutively selected. The use of RVG is considered one of the methods to evaluate root resorption because of less image distortion than with panoramic or lateral cephalometric radiographs, less radiation to the patient; time-saving features and more convenience for the patients.^{26,33,34} Cone-beam computed tomography provides better images, but because of the amount of radiation and cost, it is indicated only in special situations.³⁵⁻³⁷

Subjective method is predominantly used in qualitative root resorption evaluation studies as it does not depend on standardization of the radiograph, projection technique, requiring only similar initial root status of the groups.³⁸⁻⁴⁰ Groups with similar characteristics regarding initial age, overjet, overbite, sex distribution, and severity of Class II molar relationship were considered for comparison since some of these factors could contribute to root resorption.^{27,33}

Comparison of root resorption for the overall score between two groups showed root resorption in all anterior teeth but there was no statistically significant difference. Previous studies in which elastics and PowerScope were used as treatment modalities showed statistically significant root resorption.^{28,29,39,41-45}

PARAMETER	ELASTIC GROUP	POWERSCOPE GROUP	P VALUE	SIGNIFICANCE
MEAN CHRONOLOGICAL AGE	14 years 8 months ±1 year 2 months	14 years 6 months ± 1 year 4 months	.0326	NS
SKELETAL AGE				
CVMI 3	1	2	0.8025	NS
CVMI 4	5	4		
CVMI 5	4	4		
GENDER				
Male	6	7	1	NS
Female	8	7		

Table 1. Comparison of mean age and gender distribution of the participants in the two groups at the start of treatment

VARIABLE	ELASTIC GROUP	POWERSCOPE GROUP	P VALUE	SIGNIFICANCE
SNA	81°±1.4°	80±2.5°	0.2843	NS
SNB	76°±1.8°	75°±2.3°	0.2932	NS
ANB	5°±1.6°	6°±1.9°	0.2192	NS
GoGn-SN	29°±3.2°	30°±2.9°	0.4734	NS
IMPA	98°±3.2°	97°± 3.9°	0.5386	NS
Treatment time	2 years 1 month±3 months	1 year 5 months ± 2 months	0.0001	HS
Overjet	6.43 ± 1.67 mm	6.82 ± 1.78 mm	0.6195	NS
Molar relation				
Complete class II	6	7	0.142	NS
Half class II	8	7		

Table 2. Comparison of Baseline Data in Two Groups

	ELASTIC GROUP		POWERSCOPE GROUP		P VALUE	SIGNIFICANCE
	Mean	Std. Deviation	Mean	Std. Deviation		
Overall	1.1241	.49018	1.37	.42504	.243	NS
Individual tooth°						
11	1.21	.802	1.36	.497	.475	NS
12	1.50	.650	1.29	.726	.368	NS
21	1.21	.802	1.43	.514	.323	NS
22	1.36	.633	1.50	.760	.451	NS
31	.79	.579	1.07	.267	.095	NS
32	1.21	.426	1.71	.825	.049*	S
41	.79	.579	1.14	.363	.060	NS
42	1.14	.363	1.57	.646	.043*	S

Table 3. Comparison of overall and individual intergroup root resorption

Comparing individual teeth in both groups, lower lateral incisors showed statistically more resorption in PowerScope group. This can be explained by the fact that, PowerScope appliance is secured to the

mandibular arch wire distal to canine exerting a strong, continuous, intrusive and horizontal force vectors to mandibular anteriors.^{32,46,47} Surface area of mandibular incisors are less than that of other teeth making them

SCORE	ELASTIC GROUP	POWERSCOPE GROUP	TOTAL
0	12(10.7%)	2(1.8%)	14(6.2%)
1	75 (67.0%)	70(62.0%)	145(64.7%)
2	22(19.6%)	36 (32.1%)	58(25.4%)
3	3(2.67%)	3(2.6%)	6(2.6%)
4	0(0.0%)	1(.9%)	1(0.4%)
Total	112 (100.0%)	112(100%)	224(100.0%)

Table 4. Distributions of teeth in different groups

more susceptible to root resorption than other teeth.⁴⁴ Mandibular lateral incisors are more affected than central incisor due to the fact that force gets dissipated as it passes towards the mandibular central incisors. Elastic group showed less root resorption as the elastics can be installed and removed by the patient. The intermittent and low forces produced by Class II elastics distributed among all maxillary and mandibular teeth cannot cause unusual root resorption.^{1,49-51}

In this study treatment time was more for elastic group than PowerScope group. This can be explained by the fact that as only elastics with medium and intermittent force were used to correct moderate to severe class II malocclusion with at least half class II molar relationship.

Therefore, elastics were used for a longer period of time to correct the antero- posterior discrepancy. The mean degree of root resorption was 1.12 for elastic and 1.37 for PowerScope group. The resorption was predominantly mild (score 1) to moderate (score 2) in both groups which is considered clinically acceptable.^{28,48,50}

These results of present study showed root resorption in both elastics and PowerScope group groups but the values are clinically acceptable, encouraging use of fixed functional appliance PowerScope for the correction of mandibular retrusion as the use of elastics require patient compliance and longer treatment time. Future clinical studies with larger sample size and imaging techniques are required to establish the effect of removable and fixed functional appliance on root resorption of teeth when used for the correction of class II malocclusion.

CONCLUSION

Both elastic and PowerScope groups showed mostly mild to moderate root resorption which is clinically acceptable and lower lateral incisors showed statistically more root resorption in PowerScope group which may be explained by PowerScope exerting a strong, continuous, intrusive and horizontal force vectors to mandibular anterior teeth as compared to medium and intermittent forces by elastics.

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Topographic Distribution of Carious Lesion on Young Permanent Mandibular Molars and Its Relation to Periapical Index Score of Apical Periodontitis: A Radiographic Analysis

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INTRODUCTION: Caries in young permanent teeth progress rapidly resulting in early pulp involvement which further progresses into loss of mineralized tissue and severe periapical pathologies. The Periapical Index scoring system (PAI) proposed by Ørstavik et al. in 1986 is an invaluable diagnostic tool used to evaluate periapical lesion extent and severity by 2D digital intraoral periapical radiographic analysis with minimal radiation exposure and hence treatment planning.

AIM: To evaluate the relationship of the surface distribution of caries in young permanent molars, pulpal involvement and periapical index (PAI) score with respect to individual root forming young permanent mandibular molars.

MATERIALS AND METHOD: In this retrospective single-centre study, 100 pulpally involved carious young permanent mandibular molars were included, selected from the departmental records between August 2018-2019. Topographic distribution of caries and radiographic analysis (using PAI) was evaluated to see the effect of anatomical site of caries, individual anatomical form of root, and extent & severity of apical periodontitis developed.

RESULT: No significant correlation between the site of caries involvement and PAI score was observed. PAI score for distal roots was higher (PAI > 2) as compared to mesial root for pulpally involved carious young permanent first molars (p-value mesial root-0.576, distal root-0.591)

CONCLUSION: PAI score is independent of the topographic distribution of caries and no correlation was observed. Periapical radiolucency does not depend on caries distribution, either it is mesial, distal or occlusal.

KEYWORDS: Topography, Caries Distribution, Periapical Radiolucency, Periapical Index

INTRODUCTION

According to the World Health Organization, dental caries is the most prevalent disease globally and affects 60-90% of school children in most industrialized nations.^{1,3}

Pulp infection mainly occurs as a consequence of dental caries, trauma, and restorative procedures and frequently proceeds to pulp necrosis and apical periodontitis with localized bone destruction.⁴ In these circumstances, the apical periodontium, formed by cementum, periodontal ligament, and alveolar bone in the root apex region, is the site where complex inflammatory reactions take place.⁴ The extent of the caries of a tooth is important for periapical health. Various cross-sectional studies have been done on the prevalence and frequencies of Apical Periodontitis (AP) and demonstrated that 30-50% of individuals exhibit AP.⁵ The presence and radiographic quality of a root filling and to some extent the radiographic quality of the coronal restoration was associated with apical periodontitis in teeth.⁶ The risk of having AP increased significantly if the tooth had a deep carious extent.⁵

Permanent first molar due to its early eruption and the posterior location is most caries prone and most

treated tooth in dentistry.

In the present study, mandibular molars were included because of their root morphology as they have two roots. Hence, the correlation of caries distribution with the periapical status could be done easily. The literature has shown a more frequent association of AP with mandibular molars.⁷

AP is an inflammatory process in the periapical tissues that may develop by the penetration of bacteria into the dental pulp. The relation between AP and bacteria infecting the root canal system is well established in experimental studies.⁸⁻⁹ An infection of the coronal pulp may spread apically, and cause necrosis of the pulpal tissues, and eventually reach the apical part of the root canal. If left untreated, bacterial elements invade the periapical area and cause local bone destruction.

In order to evaluate the prevalence of AP, complete series of periapical radiographs have been used because they provide better images for the examination of the apical periodontium. Although many studies have been carried out with panoramic radiographs, many other



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authors have chosen a complete series of periapical radiographs or the association of both.¹⁰⁻¹²

There are different criteria for diagnosing AP radiographically (PAI), periapical, and endodontics status scale (PESS), (CBCT PAI).¹³ In this study, PAI proposed by Ørstavik et al. was used because it is easy to reproduce and facilitates comparison to other epidemiological studies.¹⁴ PAI is an index that can be operational and is reliable.¹⁵

Therefore, in present study topographic distribution of caries and radiographic analysis (using PAI) was evaluated to see the effect of anatomical site of caries, individual anatomical form of root and extent & severity of apical periodontitis developed consequently by PAI.

MATERIALS AND METHOD

It is a retrospective single-centre observational study carried out in the department of Pedodontics and Preventive Dentistry, SGT Dental College, Gurugram. Clinical records of 250 children were selected from the departmental records, who visited the department between August 2018 and August 2019. Out of 250, 100 intraoral periapical radiographs were selected based on inclusion and exclusion criteria.

Inclusion and exclusion criteria: Deep carious, pulpally involved young permanent mandibular molars with a distinct cavity or extensive distinct cavity with visible dentin, an extensive cavity involving at least half of a tooth surface and possibly reaching the pulp [International Caries Detection and Assessment System (ICDAS Score 5, 6)] were included. Whereas the periapical radiographs which were not clearly visible, had artifacts (i.e. dark, light radiographs, apical portion

of root not visible, etc) and endomolaris: mandibular molars with extra third root were excluded from the study.

An experienced single clinician with clinical experience of at least 5 years participated in the study as an examiner. The examiner was calibrated before radiographic evaluation, for such purpose and 100 periapical radiographs were examined. As part of the calibration phase, the study methodology was explained to the examiner; familiarized with the scores they should attribute to the periapical radiographic images, as well as with the established evaluation method for the study, to minimize discrepant results and provide greater reliability to the scores (figure 1).

A qualified radiographer had taken all the radiographs before the clinical examination. The radiographs were evaluated for the caries distribution pattern (mesial, distal and occlusal).

Further, the caries distribution was correlated with periapical radiolucency, using Periapical Index (PAI) proposed by Ørstavik et al,¹⁴ according to which 5 scores were attributed to the apical area of the radiographic images, as follows: 1. normal periapical structures; 2. Small changes in the bone structure; 3. changes in the bone structure with mineral loss; 4. periodontitis with the well-defined radiolucent area; 5. severe periodontitis with exacerbating features. Before starting the analysis, the proposed criteria for scoring the teeth with AP were explained to the examiner: 1) choose the score that most closely represented the apical periodontium status of the tooth under analysis; 2) in case of doubt, the highest score should be given; 3) all teeth with AP should be scored 3, 4 and 5, i.e., those with chronic apical periodontitis.

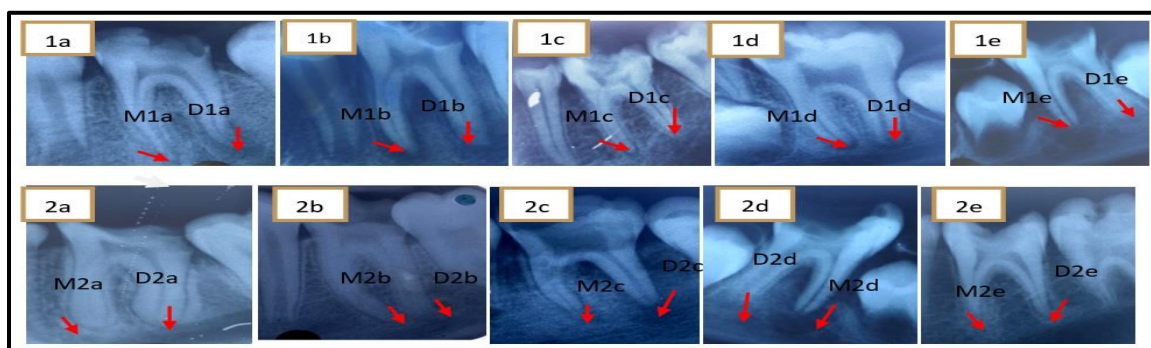


Figure 1. Intraoral periapical radiographs showing different PAI scoring-- 1a (M1a – 2 and D1a – 4), 1b (M1b and D1b – 4), 1c (M1c and D1c – 2), 1d (M1d and D1d– 3)and 1e(M1e - 4 and D1e – 3),2a (M2a and D2a-3), 2b (M2b and D2b- 2), 2c (M2c-3 and M2d-4), 2d (M2d-4 and D2d-3), and 2e (M2e and D2e-3).

RESULTS

A total of 100 periapical radiographs representative of 80 patients, 100 young permanent teeth were examined. Both sides i.e. the right and left mandibular molars were equally affected. Of the teeth examined, most common was occlusal caries i.e. 54% followed by 32% disto-occlusal and 14% had mesio-occlusal caries (table 1).

Parameter	Number	Percentage
Mesial	14	14%
Distal	32	32%
Occlusal	54	54%

Table 1. Distribution of caries on different surfaces

In case of distal root PAI- Out of 14 cases of mesio-occlusal caries 4, (28.6%) cases had more than 2 score and 10 (71.4%) had less than 2 PAI score, whereas in cases of disto-occlusal caries, out of 32 cases 13(40.6%) had more than 2 score and 19(59.4%) cases had less than 2 score, which is statistically insignificant (p-value-0.576 and 0.591) respectively (figure 2).

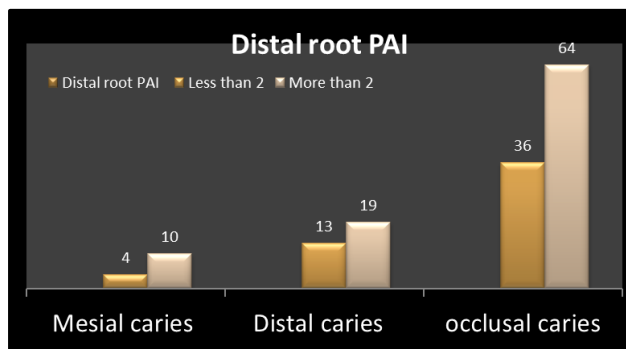


Figure 2. Relationship of mesial, distal and occlusal caries with distal root (PAI)

In case of mesial root, PAI - out of 14 cases of mesio-occlusal caries, 7 (50%) cases had more than 2 score and 7(50%) cases had less than 2 PAI score, in disto-occlusal caries out of 32 cases, 20(60.5%) cases had more than 2 score and 12(37.5%) cases had less than 2 score and the results were insignificant with p-value-0.576 and 0.765 respectively (figure 3).

On comparing more than 2 PAI score on the mesial and distal root, the mesial root had more PAI score in case of mesio-occlusal caries whereas the distal root shows

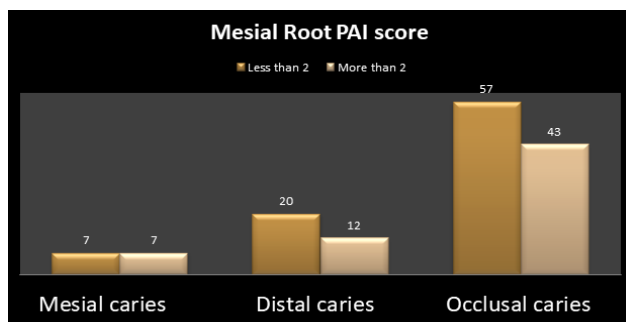


Figure 3. Relationship of mesial, distal, occlusal caries with mesial root PAI

more PAI score in case of disto-occlusal caries (Figure 4).

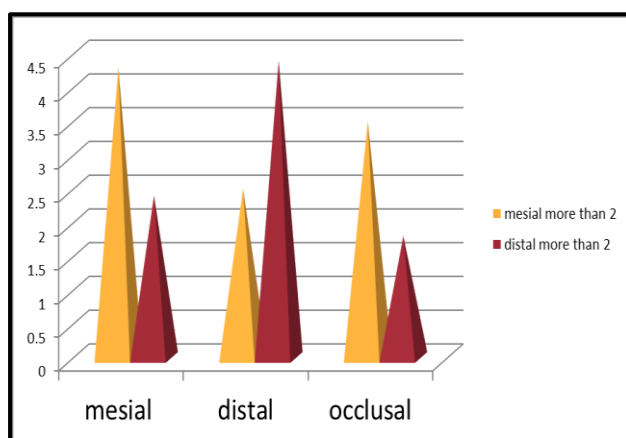


Figure 4. Distribution of caries and its relation to more than 2 PAI score in mesial and distal root

DISCUSSION

The main concern of this paper was to evaluate the distribution of caries in young permanent mandibular molars and its relation to the extent and severity of apical periodontitis.

For the diagnosis of the apical periodontitis and its relation to caries distribution, intraoral periapical radiographs were used. Some investigators suggested that in epidemiologic studies the use of a panoramic radiograph of dental health was acceptable and the validity and reliability of panoramic radiography for evaluating the AP is sustainable.¹⁶ In 2D dental radiographs, there is a lack of information in the buccolingual plane and superimposition of structures, CBCT images are more accurate for detection of AP. But the CBCT examination generates more radiation

exposure to the patient.¹⁷ However, others found that periapical radiographs are superior to panoramic radiographs in the detection of periapical lesions because panoramic radiography may under-estimate lesions that occurred when used. The radiographs of high quality were included to minimize radiographic errors.¹⁸

The diagnosis of apical periodontitis is useful because distal roots development completion takes a longer time. According to results, preventive informative education can be planned.

There are various criteria for diagnosing AP radiographically, and they vary among amongst the studies. In the present study, the Periapical Index (PAI) proposed by Ørstavik et al. was used because it facilitates the comparison to other epidemiological studies and is easily reproducible.

The increased incidence of caries on the occlusal and proximal surfaces can be correlated to the morphology of these sites, which is more retentive of food particles, relatively less protected from mechanical cleaning by the tongue, cheeks, and tooth brushing, and is not fully exposed to the flushing action of saliva.¹⁸⁻¹⁹

Distal root PAI is more than that of mesial root-because the distal canal is evidently straight and wider, and the apex closure is after mesial root apex. Therefore caries progresses more rapidly in the distal canal.

Limitations:

-Intraoral periapical radiographs were used in the study, which were not clear as high resolution digital radiographs.

-In present study, 2D dental radiographs were used, which lack the information in the buccolingual plane. Further high-quality prospective study with a greater number of samples is required to determine the relation between the caries and the apical periodontitis.

CONCLUSION

In the present study, it was observed that occlusal surfaces of permanent mandibular molar are predominantly involved followed by distal and mesial surface; Distal root PAI is more than that of the mesial root, which is independent of the topographic

distribution of caries.

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