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REVIEW ARTICLE

HAND HYGIENE - A REVIEW

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ABSTRACT

Hand hygiene is the primary measure to reduce infections. It is a simple action, but the lack of compliance among healthcare providers worldwide is a problem. Hand hygiene has been described as the cornerstone and starting point in all infection control programs, with the hands of healthcare staff being the drivers and promoters of infection in critically ill patients. In both healthcare and community settings, alcohol-based hand sanitizers have become a popular alternative to traditional handwashing with soap and water. The review gives an insight into hand hygiene, the types and indications of hand washing and hand sanitizers.

Key words: Hand hygiene, disinfection, asepsis, cross infection

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INTRODUCTION

The human skin is a reservoir of numerous microorganisms. Price, in 1938, divided the microorganisms recovered from hand into two categories: resident flora and transient flora. The resident flora is permanent inhabitant of the skin, colonize deeper layers of skin, are usually non-pathogenic, and are more resistant to removal. The transient flora on the other hand are mainly acquired from the environment or by direct contact with patients, usually do not multiply on the skin, colonize superficial layers of skin, and are most often responsible for cross infections in hospitals.[1]

Hand hygiene is the primary measure to reduce infections. It is a simple action, but the lack of compliance among healthcare providers worldwide is a problem.[2]

Hand hygiene

Hand hygiene has been described as the cornerstone and starting point in all infection control programs, with the hands of healthcare staff being the drivers and promoters of infection in critically ill patients. Hand hygiene is identified as the treating intervention strategy that reduces cross-transmission of pathogens in the healthcare environment. It has been proven to reduce the incidence of nosocomial infections[3].

In the wake of the growing burden of healthcare-associated infections, the increasing severity of illness and complexity of treatment, superimposed by multi-drug resistant pathogen infections, health care practitioners are reversing back to the basics of infection preventions by simple measures like hand hygiene. With “Clean Care is Safer Care” as a prime agenda of the global initiative of the World Health Organization on patient safety programs, it is time for developing countries to formulate the much-needed policies for implementation of basic infection prevention practices in health care set-ups.[4]

Microflora of hands

There are two types of micro-organism that colonize hands: the resident flora, which consists of microorganisms residing under the superficial cells of the stratum corneum, and the transient flora, which colonizes the superficial layers of the skin, and is more amenable to removal by routine hand hygiene. Transient microorganisms survive, but do not usually multiply on the skin. They are often acquired by health care workers during direct contact with patients or their nearby contaminated environmental surfaces and are the organisms most frequently associated with health care associated infections. The hands of health care workers are commonly colonized with pathogens like methicillin-resistant S. aureus (MRSA), vancomycin resistant Enterococcus (VRE), MDR-Gram Negative bacteria (GNBs), Candida spp., and Clostridium difficle, which can survive for as long as 150 hours. Approximately 106 skin epithelial cells containing viable microorganisms are shed daily from the normal skin. The hands may become contaminated by merely touching the patent's intact skin or inanimate objects.[4]

Types of handwash

Hand washing with soap and water has been considered a measure of personal hygiene since ages. Three main broad types of procedures can be employed for hand hygiene.

1) **Social Hand wash** - using plain non-medicated soap.
2) **Antiseptic and surgical hand wash** - using medicated soap.
3) **Hygienic and surgical hand disinfection** - using antiseptic leave on preparation.

Handwashing with soap and water removes excess organic matter and temporarily reduces the number of resident and transient flora. Antiseptics enhance the antibacterial effect and hence the transient flora is almost eliminated.

Alcohol-based hand rubs have been recommended for use in health care settings for hand hygiene.[5]

Indications for Hand Washing

The Centre for Disease Control and Healthcare Infection Control Practices Advisory Committee outlines the following indications[6]

A. Wash hands with soap and water when visibly dirty or visibly soiled with blood or other body fluids or after using the toilet.

B. If exposure to potential spore-forming pathogens is strongly suspected or proven, hand washing with soap and water is the preferred means.

C. Use an alcohol-based hand rub as the preferred means for routine hand antisepsis in all other clinical situations described in items D(a) to D(f) listed below if hands are not visibly soiled. If alcohol-based hand rub is not obtainable, wash hands with soap and water.

D. Perform hand hygiene:

   a. before and after touching the patient.

   b. before handling an invasive device for patient care, regardless of whether or not gloves are used.

   c. after contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings.

   d. if moving from a contaminated body site to another body site during care of the same patient.

   e. after contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient.

   f. after removing sterile or non-sterile gloves.

E. Before handling medication or preparing food to perform hand hygiene using an alcohol-based hand rub or wash hands with either plain or antimicrobial soap and water

F. Soap and alcohol-based hand rub should not be used concomitantly.

Hand Sanitizers

One of the many ways implemented to prevent the spread of infections is frequent and effective handwashing. In both healthcare and community settings, alcohol-based hand sanitizers have become a popular alternative to traditional handwashing with soap and water. Alcohol-based hand sanitizers have been utilized as an effective alternative to handwashing to prevent the spread of bacterial and viral infections, making it one of the essential protocols in decreasing the healthcare burden. A range of hand sanitizers is available with various combinations of ingredients and modes of delivery.

The emergence of novel pathogens, bacterial or viral, has always posed serious challenges to public health around the globe. One of these dangerous pathogens is "severe acute respiratory syndrome coronavirus 2" or SARS-CoV-2, more commonly known for causing coronavirus disease 2019 or COVID-19, which has been declared a global pandemic by the World Health Organization in early 2020.[7,8]

There are 2 large categories of hand sanitizers:

(1) non-alcohol based hand sanitizers (NABHS)

(2) alcohol-based hand sanitizers (ABHS).

The most common primary active ingredient of NABHS, benzalkonium chloride, quaternary ammonium, is a commonly used disinfectant. Disinfectants with benzalkonium chloride are generally less irritating than those with alcohol, though more recent evidence suggests it may cause contact dermatitis more often than previously thought. Although ABHS is less user-friendly on the skin than NABHS, ABHS predominate in health care settings given their low cost and efficacy of reducing infectious transmission. NABHS, however, are less worrisome regarding their flammability and abuse potential. Hand sanitizer preparations containing alcohol on the other hand can include ethanol, isopropyl alcohol, n-propanol, or a combination of these, water, as well as excipients and humectants. Solutions containing alcohols between 60% and 95% in the volume are most prevalent and effective. Humectants are included to prevent skin dehydration and excipients help stabilize the product as well as prolong the time needed for the evaporation of alcohol, thereby increasing its biocidal activity.[7]

Efficacy of Hand Sanitizers against microbes

Bacteria and fungi

Traditionally, bacteria on hands can be categorized as resident and transient floras. Common resident

floras include Staphylococcus aureus, Staphylococcus epidermidis, and Enterococcus faecalis, which colonize deep layers of the skin and are resistant to mechanical removal. On the other hand, transient floras such as Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa, colonize the superficial layers of skin. Numerous bacterial strains can be transmitted to the host from other sources that can potentially develop into a variety of bacterial infections. ABHS are very effective or quickly destroying many pathogens by the action of the aqueous alcohol solution without the need for water or drying with towels. According to the Centres for Disease Control and Prevention (CDC), ABHS has excellent in vitro antimicrobial activity, including multi-drug-resistant pathogens, such as methicillin-resistant Staphylococcus aureus, vancomycin-resistant Enterococcus. Specific in vitro studies show that hand sanitizers containing 60%-80% ethanol produced 4 to 6 log reduction in 15-30 seconds against a range of bacterial and fungal species. Numerous studies have also documented in vivo antimicrobial activity from contaminated hands. Different alcohol-based hand sanitizers have demonstrated antimicrobial effects against various gram-positive and gram-negative bacteria using the Kirby-Bauer method. With the increasing use of hand sanitizers as an infectious control measure, it is also important to note any potential tolerance mechanisms from bacteria.[7]

Viruses

Although viruses are more difficult to directly study in vivo compared to bacteria, numerous studies have attempted to validate the effectiveness of hand sanitizers on viruses. The World Health Organization recommends alcohol-based hand sanitizer formulations against bovine viral diarrhea virus, hepatitis C virus, Zika virus, murine norovirus, and coronaviruses as shown with effective inactivation in quantitative suspension tests. Other formulations from Sterillium that contain isopropanol as the main ingredient also completely inactivated enveloped enteric and respiratory viruses, such as H1N1 influenza A virus, but failed to inactivate nonenveloped viruses, except rotavirus. As evidence on the novel SARS-CoV-2 continues to rapidly emerge, data from previous coronaviruses can be extrapolated in the context of the efficacy of hand disinfection given their structural similarity.[7]

Sanitizers versus soaps

Numerous hand sanitizers, consisting of different ingredients and methods of application, have been compared. However, the CDC recommends washing hands with soap and water whenever possible over hand sanitizers, in the community setting. This is because handwashing reduces the amounts of all types of germs and chemicals on hands. But if soap and water are not available, using a hand sanitizer with at least 60% alcohol can help you avoid getting sick and spreading germs to others. Hand sanitizers may not be as effective when hands are visibly dirty or greasy. The guidance for effective handwashing and use of hand sanitizer in community settings was developed based on data from several studies conducted in community settings.[9-11] Regarding clinical settings, studies show that hand sanitizers work well, where hands come into contact with germs but generally are not heavily soiled or greasy.[5,11-13]

Selection of hand sanitizers

The major determinants for selection of hand hygiene products are antimicrobial profile, user acceptance, and cost. Post-contamination hand hygiene products must have at least bactericidal, fungicidal (yeasts), and virucidal (coated viruses) activity. Since hands of HCWs are frequently contaminated with blood during routine patient care, activity against coated viruses should be included in the minimum spectrum of activity of an agent for hand hygiene. Additional activity against fungi (including molds), mycobacteria, and bacterial spores may be relevant in high-risk wards or during outbreaks. Pre-operative hand hygiene should be at least bactericidal and fungicidal (yeasts) since the hands of most HCWs carry yeasts and surgical-site infections have also been associated with hand carriage of yeasts during an outbreak. Hospital administrators should also consider the acceptability of the product (smell, feel, skin irritation) by the users and its allergenic potential. An alcohol-based hand rub requires less time, is microbiologically more effective, and is less irritating to the skin than traditional handwashing with soap and water.[4]

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REVIEW ARTICLE

RISKS ASSOCIATED WITH THE USE OF FACE MASKS DURING THE COVID-19 CRISIS

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ABSTRACT

After the emergence of COVID 19, face masks have become a clothing accessory that is worn every day and everywhere. Even though face masks offer excellent protection against microbial invasion, they are not free from the inherent or acquired ill effects. Being regular users of face mask, individuals should be aware about the associated risks and detrimental effects too. This review gives an insight on the risks associated with the use of face masks during the COVID-19 crisis.

Keywords: face mask, risk, COVID 19, pandemic.

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INTRODUCTION

Face masks, within the last year or so, have come to be a topic of discussion in public dialogue and political debate, which is greater than ever earlier than. Using face masks at the community level for sickness prevention can be traced lower back to the time of the Manchurian plague (1910-1911). At some point in this epidemic, the crew operating on the containment of this sickness, suspected airborne transmission of this pneumonic plague and recommended human beings wear gauze masks in addition to quarantining the patients. Nearly a century later, with discoveries and advancements in knowledge of infectious sicknesses, face masks have become the first line of protection in opposition to severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and now the COVID-19 outbreak because of the unconventional coronavirus SARS-CoV-2. The knowledge that using face masks delays SARS-CoV-2 transmission is rapidly gaining recognition amongst the general population. This solid the exponential use of masks of diverse kinds, now not just via health workers but also by using generational population as Personal Protective Equipment (PPE).[1]

The surgical face masks have ended up being an image of our times. Face masks have become a clothing accessory that is worn every day and everywhere. A variety of shapes, forms, and materials are getting used and advertised to the factor that during 2020 the commercial enterprise of manufacturing and selling face masks became born.[2]

Carrying protective masks, goggles, and gloves, thorough hand washing, in addition to the common use of topical antiseptics became compulsory for a large spectrum of the population and healthcare workers. Very quickly this ended in occupational skin damage amongst clinical professionals consisting of facial skin injury on the back of the nose, forehead, and suprazygomatic area.[3] This review gives an insight on the risks associated with the use of face masks during the COVID-19 crisis.

Types of masks

There are 3 forms of face mask available within the market: (i) COVID-19 - material mask, (ii) clinical mask, and (iii) respirator mask (N95 and N99).

Risks associated with the usage of face masks

Wearing masks has its blessings and undeniable shielding effects against infections. However, there are also potential risks and side effects that crop up during the usage of masks for a prolonged time. This specifically applies to the use in the general population.[4]

Sporting masks for an extended amount of time causes a host of physiologic and psychologic burdens and might lower work efficiency. Interest can't be achieved as long or as correctly whilst carrying a mask compared to while masks aren't worn. Additionally, the time frame that an activity can be sustained is decreased when wearing masks and PPE. Prolonged use of N95 and surgical masks causes physical adverse effects such as headaches, difficulty breathing, acne, skin breakdown, rashes, and impaired cognition. It also interferes with vision, communication, and thermal equilibrium.[5,6]

Complications like headaches related to extended mask use can be attributed to mechanical factors, hypercapnia, and hypoxemia. Tight straps and pressure on superficial facial and cervical nerves are mechanical features causing headaches. Cervical neck stress from donning PPE, sleep deprivation, abnormal mealtimes, and emotional pressure are other resources of complications amongst healthcare experts at some stage in extended mask use. Tight-fitting masks cause inadequate ventilation and increased levels of carbon dioxide (CO2) known as hypercapnia. As CO2 is an acknowledged respiratory stimulant, the build-up of exhaled CO2 between the mask and face will cause increased lung ventilation and respiratory activity. Signs and symptoms of hypoxemia which includes chest pain and tachypnoea also are cited by healthcare professionals with prolonged mask use. Exhaled CO2 builds up between the mask and face, and increased levels of CO2 cause confusion, impaired cognition, and disorientation.[5,6]

A hot and humid environment is found within the facial region covered by masks, which reasons for pain, and hyperthermia. This can create a scenario where the healthcare professional is unable to understand risks and perform manual tasks, and it considerably affects motor competencies. The moist/wet surroundings and pressure from tight-fitting masks additionally block facial ducts. This

may explain the growth of acne with prolonged mask use.[5,6]

Frequent PPE and mask changes may cause shearing and breakdown of the skin, and breakdown on the bridge of the nose and cheekbones can be attributed to tight-fitting masks and goggles that put stress on those precise areas.[7]

Formaldehyde is a chemical utilized in PPE that some are sensitive to and/or allergic to. Frequent frictions due to the straps, trapping of sweat, use of disinfectant to reuse mask, and usage of dyes for coloration of the homemade mask are common reasons for dermatitis using ear loop face mask. The strap fabric which includes a thermoelastic polymer, rubber, and latex further leads to contact dermatitis. Furthermore, the mask can cause exacerbation of pre-existing dermatoses. Others may react to thiuram which is found in the ear loops of surgical masks.[8]

Literature review

Chia et al. used a questionnaire to analyze the perception of doctors, nurses, and other personnel on the role of PPE (personal protective equipment) during the SARS outbreak in Singapore for 2 months in 2003. It was reported that even qualified staff did not have sufficient knowledge of the protective properties of face masks during a pandemic. This study highlighted the importance of adequate communication, education, and the exchange of information in a timely fashion.[9]

Kim et al. studied the role of N95 masks on lung function and heart rate during low-to-moderate exercise/physical workload. In their study, they reported that only healthy subjects seem to tolerate wearing such a mask.[10] The most frequently reported adverse skin responses (68.9%) among healthcare workers who used N95 masks were nasal bridge scarring and face itching (27.9%) reported by Kaihui et al.[11]

Chowdhury et al reported that 48.76% of the respondents had unfavorable skin responses beneath the face masks; female gender, physicians, professionals working more than 32 hours a week, wearing N95, and more than one mask were predictors of skin problems. 28.47% and 60.15% of all participants suffered from some form of oral and neurological problems, respectively. A humid environment causes increased sweating and dehydration, which eventually reduces saliva water and can finally cause dry mouth and halitosis. Oral problems are nearly four times more common among N95 mask users. N95 may form a tight barrier that prevents normal nasal breathing, forcing a person to breathe through their mouth. Mouth breathing may disturb oral flora, resulting in oral problems, increased caries risk, and halitosis.[12]

Foo et al. reported that 35.5% of the medical staff who used N95 masks regularly, complained of facial dermatitis, acne, and the pigmentation of cheeks, chin, and nasal bridge. It was also reported that dermatitis with pruritic lesions mainly caused irritation, but allergic contact dermatitis occurred because of the adhesives or other parts of the respiratory mask, like rubber straps and metal clips.[13] A profound number of healthcare professionals who participated in a survey conducted by Rosner E reported adverse reactions to prolonged mask use during COVID-19.[5] A study by Lim et al. focused on headaches related to N95 face mask use in health care workers.[14]

Recommendations to avoid risks associated with face masks use

High-quality FFP2/3 masks are more reliable protection from infections. They should always be available for medical staff and people at risk. When used by the general population, specific groups at risk for complications related to mask use should be educated on what to expect. For example, patients with severe COPD can experience a deterioration of their respiratory parameters. Therefore, patients must be individually educated by their general practitioner about the risk of wearing masks. Finally, the user must be educated on the different types of masks available, how and when to wear them, and, above all, how to handle them correctly, similar to the safety instructions given before take-off in an aircraft.[2]

It would be better if healthcare professionals use headband with buttons to allow ear straps to rest on these items instead of behind the ears, if they are working for long hours. Fresh mask for each shift is also a better option to avoid skin breakdown. The general population, using homemade face masks should use cotton cloth-based masks with gaiters of appropriate elasticity and avoid any disinfectant application. Persons with pre-existing dermatoses including atopic dermatitis, seborrheic dermatitis, and chronic urticaria need to take special precau-

tions and the use of disposable surgical masks should be encouraged.

Conclusion

Measures to prevent infections are important for the contemporary pandemic. Face masks have been considered a first step to save you and comprise the spread of the ailment. Frequent breaks, improved hydration and rest, skin care, and probably newly designed comfortable masks are hints for future management of detrimental effects associated with prolonged mask use. More studies of the filtering efficiency of various varieties of masks are also wanted.

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REVIEW ARTICLE

INJECTION MOLDING TECHNIQUE AND GENOTOXICITY IN DENTAL PRACTICE - A LITERATURE REVIEW

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ABSTRACT

Biocompatibility of dental materials is of great concern for dentists, patients, public health services, competent authorities, standardizer's, dental technicians, laboratories, manufacturers and notified bodies. Several molding techniques have been advocated for processing denture base resins. Injection molding technique stand ahead as it has been proven to cause less dimensional change, less leachable methyl methacrylate and less exposure to laboratory technicians.

Key words: Injection molding, Genotoxicity, Poly methyl methacrylate

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INTRODUCTION

Researches concerning the biocompatibility of dental materials still remains contradictory.[1] Dentures, are prosthetic alternatives, constructed to replace missing teeth and are supported by the surrounding soft and hard tissues of the oral cavity. Dentures contribute towards improving mastication, aesthetics, phonation, and self-esteem in patients. Modern dentures are most often fabricated in a commercial dental laboratory or by a Prosthodontist using a combination of tissue shaded powders - Polymethyl methacrylate acrylic resin (PMMA) that are available as heat cured or chemically cured types. Polymethyl methacrylate (PMMA) offers numerous advantages of being highly aesthetic in nature and at the same time being cost-effective.[2]

In certain instances, patients show allergic reactions on the supporting mucosa after wearing PMMA prosthesis. The residual monomer in the prosthesis is thought to be the cause of the allergic reaction.[3] Oral reactions to acrylic resins include symptoms such as burning mouth and tongue, redness, and erosions of the oral mucosa. Causes of these symptoms include trauma from ill-fitting dentures, local chemical irritation caused by acrylic resin or its constituents, or other systemic and oral diseases not related to acrylic resin. Ill-fitting or poorly adjusted dentures are the most common cause of denture discomfort. Methyl methacrylate monomer has also been shown to be a primary irritant, eliciting a localized inflammatory response by direct action on the tissues. Allergic reactions to methyl methacrylate monomer are usually observed as contact dermatitis. Completely polymerized methyl methacrylate probably does not cause such reactions.[4]

Physico-chemical features of denture base resins

A polymer is a high molecular weight chemical compound, which by means of a repeated intermolecular chemical reaction becomes a long-chain and/or cross-linked macromolecule composed of several repetitive united molecules with a lower molecular weight (monomers).[5,6,7] In the dental field most of them are organic molecules, particularly derived from methacrylates.6 Other types of polymers based on polyacrylic acid (PAA) or poly dimethyl siloxane (PDMS) are also widely employed in dental practice.[8]

Though dental polymers are considered insoluble in water, imbibition may occur, resulting in undesirable dimensional alterations. The water/solvent molecules are adsorbed through the porosities and interchain spaces and expand the matrix network (plastification).[9] As a consequence, the polymer softens and swells, but does not dissolve, compromising the material's clinical performance.[6]

Polymerization may occur by two distinct processes: addition or condensation. The condensation (growth-step) reaction is typical of elastomers and is characterized by a simultaneous reaction of the bifunctional monomers that gradually connect each other and many times, as a consequence, may produce low molecular weight byproducts. Conversely, during the addition polymerization, which is the most usual in the dental field, the monomers are activated one by one, but are rapidly added to the main chain without changing the composition and, theoretically, can produce almost unlimited giant molecules if monomer is available.[6] The addition polymerization reaction is exothermal, reaching considerably high temperatures. It has been reported that auto polymerizable PMMA acrylic bone cement's peak temperature may range from 50-120ºC.[9]

The reaction may be inhibited or delayed by the presence of impurities and the contact with oxygen, which react with the free radical sites of either the activator agent or a growing polymer chain. Hydroquinone (HQ) (<0.006%) may be added to the monomer composition as an inhibitory agent, avoiding its spontaneous polymerization.[6]

Residual monomer as a biological hazard

Stomatitis is a multifactorial oral condition that has been extensively associated with PMMA denture base resins, which may be caused or related to poor oral hygiene, mechanical trauma, wearing denture during the night, smoking, systemic and nutritional conditions, bacterial and fungal infections, as well

as reactions to chemical aggressions such as mucosal irritation or allergy by MMA.[10-13] Prevalence has been reported to be between 15 and 70% in denture wearers, and it is more frequent in elderly people and women.[12]

Patients have registered diverse systemic reactions to dental acrylic resin such as contact dermatitis and asthma, local inflammatory lesions like lichen planus, gingivitis, ulcerations, eczema, erythema, blisters and erosions, papilloma, fibroma, and burning mouth sensation, especially on the mucosal surface of the prosthetic support and oral adjacent tissues.[14,15,16] Acrylic resin contact allergy in patients is a rare condition, since the polymerized PMMA is non-sensitizing.[17] Polymers being macromolecules, risk of gastrointestinal or dermal absorption is minimal and the respiratory tract contact is considered negligible.[18] Studies have however shown that unpolymerized acrylic monomers generally induces sensitization and/or irritation and is widely recognized in professionals related to dentistry (dentists, dental assistants and technicians and methacrylate manufacturing personnel) in form of allergic contact dermatitis in hands or face, occupational respiratory hypersensitivity and local neurological injuries.[17,19,20] Use of clinical gloves has shown to provide only a limited protection from MMA contact.[19]

The relationship between increased prevalence of death caused by respiratory, stomach or colo-rectal cancers and occupational exposure to MMA in the manufacture of PMMA products and concluded that the cancer cases were probably more related to life style habits. Hence there is little evidence that MMA is a human carcinogen.[21,22]

Generally, heat-polymerized acrylic resins are mostly preferred in dentistry. Despite its satisfactory properties, it has the potential to elicit irradiation, inflammation and allergic reactions in the oral environment. Acrylic resins contain methyl methacrylate monomer, methacrylic acid, benzoic acid, plasticizers, phenyl benzoate, phenyl salicylate and dicyclohexyl phthalate. These materials can be responsible for hypersensitivity and allergic conditions to dental laboratory persons and denture wearers prior to and after the polymerization.[23]

Acrylic resins have been modified to improve physical and chemical properties through processing techniques such as injection molding. There are many injectable PMMA systems and they claim to fabricate more accurate denture bases than conventional PMMA by constant flow of material from the sprue compensating for the polymerization shrinkage.[24,25] The processing technique, rather than the choice of the resins, seems to be the dominant variable with respect to dimensional changes.[26]

The trapped residual monomer may leach from the polymer in clinical conditions and consequently can cause biological hazards, such as cytotoxicity and genotoxicity.[27] The smaller molecular monomers are more cytotoxic and there is a direct linear relationship between cytotoxicity and molecular hydrophobicity. The hydrophobic molecules can interact with the phospholipid bilayer of the biologic membranes.[28,29]

Auto polymerized acrylic resin shows ahigher level of residual monomer than heat-cured resin.[30] Higher amounts of methylmethacrylate (MMA) was detected in the saliva of subjects wearing dentures made from auto polymerized resins compared with heat-cured resins.[31]

These resins performed higher cytotoxic effect than heat-polymerized resin and it was statistically significant at 1-day period and that the highest cytotoxic effect was observed at 5-day incubation period.[32]

Microwave post-polymerization irradiation can be an effective method for increasing the flexural strength of denture liner (at 650 W for 5 minutes) by reducing the residual monomer content by further polymerization at free radical sites.[33] Residual monomer content in acrylic dentures could be detected for up to several years after use. While it appeared that most of the residual monomer was lost after about five years, complete loss of the residual monomer content may take many more years.[34]

Injection molding technique

Among denture processing methods, injection molding has always been interesting for researchers

because of compensation of polymerization shrinkage due to the pressure exerted by injection of the acrylic resin.[35]

Smaller resin particles, lower polymerization temperature, absence of resin film formation between the two halves of the flask, and absence of displacement of the two halves of the flask during resin packing, may be the causes for better dimensional accuracy of the injection molding technique.[36] Injection-molded acrylic resin generally requires a greater monomer content to improve flow characteristics and facilitate filling of the mold cavity, often resulting in additional unreacted monomer within a polymerized acrylic resin.[37] The cytotoxicity may be reduced by controlling the acrylic resin monomer/polymer content by manufacturer in capsule form and thus decreasing the unreacted residual MMA original ready to use ratio. In case of compression molded technique as the monomer polymer ratio is carried out by dental auxillary staff, it is not always accurately possible for complying with the manufacturer's instructions.[38] From a health and safety perspective, the injection process eliminates the direct handling of resin during the packing process that significantly reduces methyl methacrylate exposure. From a laboratory perspective, the technique could be completed in a relatively short period and does not require repetitive opening and closing of the flask. Also, this process minimizes the likelihood of underpacking or overpacking the mold cavity.[39]

Chopped E-glass fibers shows an increase in transverse strength, elastic modulus and impact strength of injection-molded denture base polymer.[40] Injection molding procedure exhibits less shrinkage than those produced by the conventional press-pack procedures.[41] Injection molding have demonstrated a slightly less increase of vertical dimension of occlusion than conventional polymerization techniques.[42,43,44] This molding technique have been shown to have a less dimensional change than those cured by the conventional and the microwave curing methods producing a more accurate denture base.[45] Injection-molded resin shows better internal adaptation compared with the conventional heat-polymerized and the microwave-polymerizedresins, particularly after 30 days.[46]

DISCUSSION

Retention rates for natural teeth are on the rise, indicating a significant reduction in the demand for removable prosthesis.[47,48] Middle-aged populations experience improved health care and longer life spans compared to previous generations. There is a possibility that edentulism could rapidly decline. More current information, however, supports the fact that the number of older adults is on the rise and that the number of edentulous elderly will actually increase in the next two decades.[49,50]

Acrylic resins, which are the most commonly used material for dentures, are usually composed of prepolymerized polymethyl methacrylate (PMMA) powder particles, which are mixed with monomers of methyl methacrylate (MMA).[51] Despite various methods being employed, such as chemical activation, visible light activation, or heat activation using hot water or microwave energy, to initiate the polymerization of denture base resins, the conversion of monomer to polymer is never complete and some unreacted monomer, called residual MMA monomer, is left in the denture base polymer.[52]

This residual MMA is considered an allergen[53] and can cause local adverse reactions, such as erythema, burning sensation, edema, fissures, necrosis, pain.[54,55] It has also been shown to cause systemic reactions,[56] such as - labial edema,[54] chronic urticaria,[57] difficulty in swallowing, and hypersalivation.[58] Studies documents the allergic tendencies towards MMA resins in a 60 year old lady despite the residual content of monomer being within the international standards. Also a patch test on the patient revealed positive reactions.[59] MMA is also considered cytotoxic[60] as well as possibly genotoxic.[61]

Various in vitro studies also showed the leaching of monomer at a higher value during the first week31 Residual MMA released into saliva after incubation for 24 hours can cause cell toxicity in vitro and wearing of newly made dentures could cause oral tissue irritation because of these leachable substances. Monomer could also leach out of the denture base

when immersed in water.[62] Minor irregularities of fit in new dentures may also result in irritation that makes the mucosa more susceptible to MMA in the first few days. Hence it is of necessity to advice the patient to immerse the denture in water at room temperature during night or when not in use.[63]

Various studies have shown that the residual monomer is highest during 24 hours after insertion, and then decreases further. The leaching of residual monomer even though in low quantities, can sustain for many years.[64]

Literature shows that the techniques used for molding denture base resins could also be a factor in determining the amount of residual monomer content. Irrespective of the denture base resin used, genotoxicity was more prominently seen with compression molded technique, when compared to injection molding technique. Main cause attributing genotoxicity is the amount of monomer which is in turn altered with altering the Powder - Liquid ratio.[62] In case of injection molding pre weighed cartridges are used which helps in reducing the residual monomer content. This is not completely possible by manual mixing in case of compression molding. Also, the additional pressure used in injection molding can reduce the residual monomer content.

CONCLUSION

Selecting a suitable denture base material and processing with injection molding technique will aid in limiting the extent of genotoxicity and could reduce the potential side effects to the patient considerably. It will also aid in fabricating removable prostheses with minimal genotoxicity and limit other concerns in patients. A poly methyl methacrylate denture base material that is less genotoxic will offer patients, complete dentures with minimal side effects and adequate biocompatibility. It is recommended that the patients be advised not to wear newly made dentures overnight, as this may cause mucosal irritation from the potential effects of leachable substances.

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CASE REPORT

SECONDARY PERIODONTAL MANAGEMENT OF SYMPTOMATIC ROOT CANAL TREATED TOOTH- A CASE REPORT

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ABSTRACT

Endo-perio lesions mostly occur due to the proximity of anatomic and vascular connections between the pulp and the periodontium. Endodontic-periodontal combined lesion pose a clinical dilemma primarily because of difficulty in choosing the right treatment and prognosis determination. If primary endodontic lesion is left untreated, it can result in the secondary involvement of periodontal collapse. This case report presents the diagnosis and treatment adopted for a primary endodontic lesion with secondary periodontal involvement by means of a combined therapy involving GTR and osseous graft.

Key words: endo perio lesion, furcation, regenerative therapy, swelling.

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INTRODUCTION

Around 50% of tooth mortality results due to pulpal and periodontal problems. A common functional, anatomical and embryonic interconnection is shared by these tissues. The strong relationship between periodontal and pulpal tissues and the associated diseases can be traced to the origin of embryological development, where they share a common mesodermal source as origin.[1]

In 1972, Simon, Glick and Frank classified endoperio lesions into the following categories[2]

- Primary endodontic lesion
- Primary periodontal lesion
- Primary endodontic lesion with secondary periodontal involvement
- Primary periodontal lesion with secondary endodontic involvement
- True combined lesion

Treatment and prognosis of the individual lesions depend upon the diagnosis, extent of pulpal and periodontal involvement and systemic conditions of the patient. In case of an endodontically treated tooth with periodontal involvement, furcation involvement is a matter of concern. The greater incidence of accessory canals in molar teeth supports the association of the role of pulpal pathology in furcation involvement.[3]

Case report

A 54 year old female patient came to the out patient department with a chief complaint of pain and swelling in the lower right back tooth since 4-5 days. The patient had severe pain for the past few days. She gave a history of black coloured restoration done long back in the lower right back tooth region.

On clinical examination an amalgam restoration was present in relation to 46. [Figure 1] The tooth was tender on percussion. Swelling could be appreciated along the buccal mucosa of 46. On radiographic examination secondary caries was observed along the distal aspect approximating pulp.

The proposed treatment plan was conventional root canal treatment of 46. Prior to the start of treatment, informed consent was obtained from the patient. Root canal retreatment was initiated with adequate access preparation of 46. In the first appointment cleaning and shaping was completed and proper irrigation protocols were followed and intra canal medicament was placed. Working length was calculated using Woodpex 3 apex located which was correlated with X ray measurements. Cleaning and shaping was done with the appropriate file systems. The root canals were simultaneously irrigated with 17% EDTA solution and 5.2% Sodium hypochlorite along with intermittent saline irrigation. After 2 weeks, the patient was found to be asymptomatic with all the symptoms got subsided. Later single cone obturation was attempted.[Figure 2]

Figure 1: Pre- operative clinical view

Figure 2: Post endodontic treatment IOPAR

Within a few days of obturation, the swelling reappeared. [Figure 3] Thus it was planned to assess the possibility of periodontic involvement of the root canal treated tooth. Sinus tract tracing was done with gutta percha cone which showed a clear-cut area of infection around the furcation area. [Figure 4]

The patient was referred to the Department of Periodontics for further evaluation of the periodontal status of the tooth. The probing depth was calculated to be approximately 5mm depth. But, there was a Grade II furcation involvement when measured using the Naber's probe along the buccal surface of the tooth. This led to a diagnosis of Endo perio involvement of the case with primary endodontic lesion with secondary perio involvement.

Following the diagnosis periodontal regenerative surgery was planned in this case for treatment of furcation defect. After taking care of asepsis and sterilization the surgery was planned. The selected site was prepared for surgery and was anesthetized using xylocaine with adrenaline. Regenerative flap surgery was initiated with Kikland incision followed by full thickness flap was elevated buccally extending from the distal aspect of 45 to the mesial aspect of 47. [Figure 5] After reflecting the flap of involved area, thorough degranulation and debridement was done using Gracey's curette # 13 and 14. After adequate isolation of area and proper bleeding control, osseous graft (xenograft) and healiguide (GTR membrane) was placed. Into a sterile dappen dish, the osseograft was incorporated and was mixed with normal saline to reach a packable consistency. Later the bone graft was packed into the involved site in increments with the help of wet gauze and condenser.

Figure 3: Reappearance of clinical symptoms

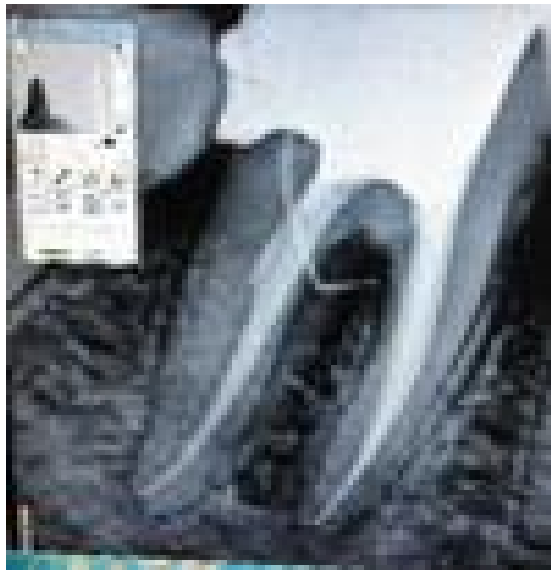

Figure 4: GP tracing

Figure 5: Incision placed & flap raised

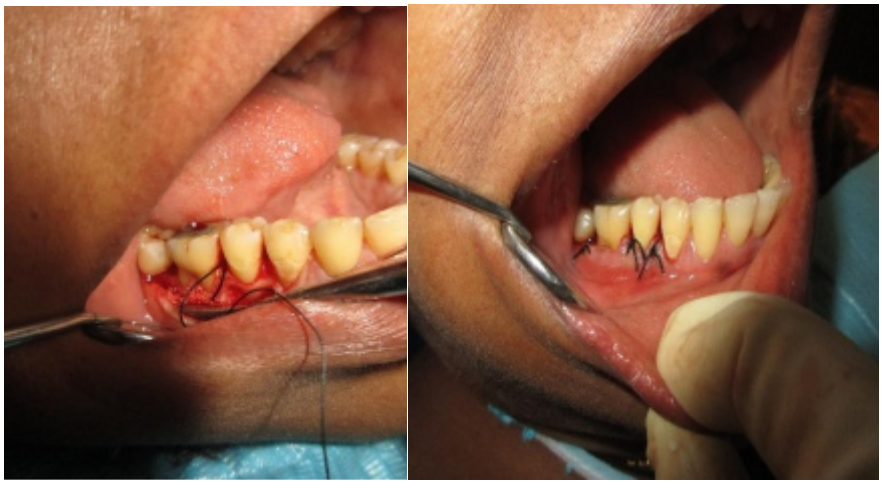

Figure 6: Flap repositioned and suturing

Figure 7: Post -operative view

Adequate filling followed by tight condensation of the bone graft was ensured. All possible measures were taken to avoid over filling the defect. The primary soft tissue closure was done with non-resorbable black silk (3-0) suture. [Figure 6].

As a part of post-operative instructions, the patient was recommended to follow plaque control measures and was prescribed 0.12% chlorhexidine mouthwash for twice daily. The first recall was scheduled after 10 days. The sutures were removed 10 days after surgery. The post operative view is given in Figure 7. The subsequent visits were scheduled at fixed intervals till the normal probing depth of 2-3 mm was achieved.

Discussion

In the current scenario as the patient complained of severe night pain of the involved tooth, radiograph was taken to confirm the endodontic involvement. The radiographic findings were in line with the clinical symptoms, hence root canal treatment was initiated. But the re-appearance of symptoms even after post endodontic therapy left behind the suspicion of periodontal involvement. Generally in case of a primary endodontic lesion, a satisfactory endodontic therapy would result in curing of the endodontic component.[1] Here there were no changes in clinical parameters, along with the incomplete waning of symptoms. On subsequent periodontal check-ups, the case was diagnosed as primary endodontic lesion with secondary periodontal involvement.

Tinti and Vincenzi in 1990 used the principles of guided tissue regeneration (GTR) to obtain coverage of the denuded root surface along with regeneration of the entire attachment apparatus.[4]

Guided Tissue Regeneration has been extensively studied to have the potential to regenerate periodontal attachment to an acceptable extent in humans.[5]

Generally, collagen is the most commonly used GTR membrane. It is documented that the inherent incapability of collagen to generate and maintain space by itself between the root surface and the overlying GTR membrane results in poor prognosis. The immigration of progenitor cells onto the detoxified root surface and their subsequent differentiation into cementum and periodontal ligament cells requires space beneath these membranes. For this purpose, along with Healiguide an osseous graft had been introduced. Healiguide, a bio resorbable membrane mainly consists of Type I collagen and has haemostatic property that permits the membrane to hasten the wound healing in the surgical site, thus yielding faster result.[6] The use of bone grafts help in preventing the collapse of the membrane into the defect area and enable the proliferation of osteogenic progenitor cells.[7,8]

Conclusion

The finding of this report indicates that the combined use of GTR technique (collagen membrane) and a xenogenic bone graft material proved to be successful in the management of periodontal defects. This blend of these two technique yielded better results outcomes in terms of clinical and radiographic parameters.

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CASE REPORT

MANAGEMENT OF ROOT CANAL TREATED TOOTH OBTURATED WITH INSTRUMENTS- A CASE REPORT

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ABSTRACT

Even though rotary instruments pose varied extent of flexibility and ease of use, they are not free from disadvantages. Endodontic mishaps are not uncommon in clinical practise. Management depends on the clinical scenario and also on the outcome of weighing the risks and benefits. This case report presents nonsurgical retreatment of a maxillary left premolar previously obturated with fragmented root canal instrument.

Keywords: fractured, instrument, obturation, root canal.

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INTRODUCTION

Rotary instruments have revolutionised the branch of endodontics to a great extent with its extereme property of flexibility. This has its remarkable impact in providing quality treatment, reducing operator fatigue and time invested for each case. Even with these advantages, procedural accidents can interfere the sequential phases of root canal treatment at any stage as all steps are co-dependent and correspondingly vulnerable to iatrogenic errors. In majority of the cases, such mishaps arise because of the working dentist's specious manipulation and negligence to detail whereas in few situations, random or unpredictable errors might occur.[1] When an error either intentional or accidental occurs during root canal procedure pose a great risk of treatment failure and related complications. A separated endodontic file in the canal may cause anxiety, anguish, and agony to the patient.[2]

This article shows a case report of nonsurgical retreatment of a maxillary left premolar previously obturated with fragmented root canal instrument.

Case report

A 29 year old male patient reported with pain and swelling on the gums in relation to upper left tooth since 1 week. Patient gave a history of root canal treatment done on that area few years back.

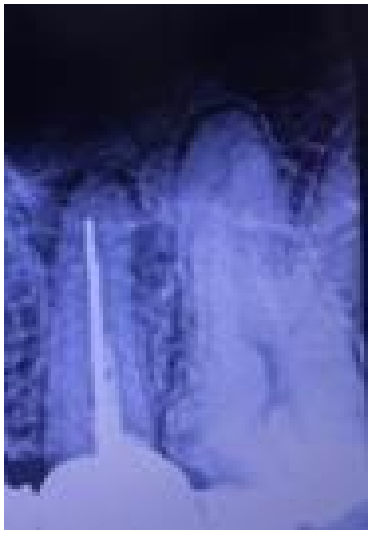

Figure 1: Pre-operative IOPAR

On clinical examination, it was observed that the patient had a mild swelling on the gingiva in relation to the buccal aspect of 25. The area was soft tenderness on percussion was appreciated w.r.t 25. There were no signs of mobility or other periodontal involvement. The tooth had metal ceramic crown over it. On radiographic examination, it was found that the tooth was obturated with root canal instrument similar to H file, which was found to be a strange old way of root canal obturation technique. The obturated instrument covered more than two thirds of the canal. The obturation was short of apex by around 2-3 mm. Periapical radiolucency around the root apices and lateral surfaces of root could be appreciated. [Figure 1]

Conventional retreatment was planned, keeping in mind the quality of preceding obturation and the periapical status of the roots. Since the dental crown had an appreciable adaptation and marginal fit, access through the crown was decided for retreatment of the tooth. Prior to the start of treatment, informed consent was obtained from the patient. Root canal retreatment was initiated with adequate access preparation, refined using a trans metal bur. Amalgam restoration was removed until the instrument was made visible. Using hand files 08 and 10 Mani K files the instrument was bye passed. The ultrasonic tip Start X # 4 was used to trough around the instruments in both the canals. With the

Figure 2: Instrument removed from the canal

help of ultrasonic vibration the obturated piece of instruments started loosening from the canal and were retrieved in single from each canal. [Figure 2]

The retrieved fragments measured around 13 mm and 15 mm. [Figure 3] The canals were then negotiated till the apex using 08 and 10 K files. Working length was calculated using Woodpex 3 apex located which was correlated with X ray measurements. Cleaning and shaping was done with Neo Endo Flex files 17/4%, 20/4%, 25/4% and 30/4%. Simultaneous irrigation of the root canals were done with 17% EDTA solution and 5.2% Sodium hypochlorite with intermittent saline irrigation. Circular counter clock motion agitation was used using ultrasonics for enhancing the action of irrigants used. Calcium hydroxide and Iodoform mixed Metapex was used as an intracanal medicament for a period of 1 month. The canals were dried and filled with gutta-percha and sealer cement. The access was temporized with CaviTemp. Analgesics were also prescribed for 3 days.

The patient was recalled after a period of 1 month and was examined for any symptoms. The swelling present on the gingiva in relation to 25 got subsided and no tenderness on percussion noted. The access

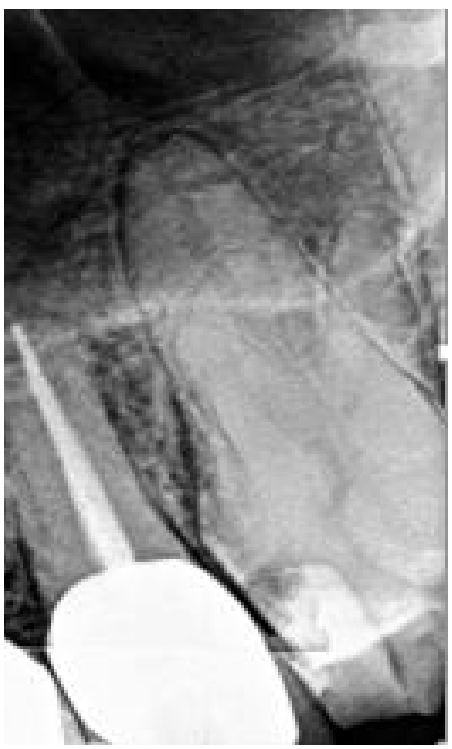

Figure 3: Retrieved instruments

Figure 4: Post-operative IOPAR

was re-established and intra canal medicament was removed. Irrigation protocols were followed. The master apical GP was inserted to the working length and radiograph was taken, following which the GP points were obturated using single cone obturation technique using AH plus sealer. The access was temporized. The permanent filling was done with composite resin material after 2 days and occlusion was verified. On subsequent recall visits, the patient was found to be asymptomatic. [Figure 4]

Discussion

In the current case, the root canal was obturated with fragmented instrument, which was found to be quite lengthier when compared to other cases. The longer fragment of instrument leaves behind the question whether the fracture was intentional or accidental. The patient was not informed about the fragment by the first dentist.

The foremost concern is that a detached instrument can hamper the disinfection and cleaning of root canal, influencing the treatment outcome indirectly. Therefore, the benefits of retrieval should be weighed against the risks of other complications that could occur during the retrieval process.

Generally the two common approaches for management of root canals obturated with fragmented instruments are surgical and non-surgical methods: These include retaining the separated instrument in the canal while treating the remaining portion of canal, bypassing the fragment and treating the remaining canal, retrieval of the separated fragment, followed by treatment of canal and adopting surgical methods for instrument retrieval and subsequent treatment.[3,4]

In this case scenario, being a more conservative approach, the non-surgical endodontics was attempted for the retrieval of instrument and re-treatment. Both tooth related and instrument related factors influence the non-surgical retrieval of instruments. Instrument related factors include the size, position, length, type and diameter of the fragment inside the root canal whereas root dentin thickness, canal anatomy and concavities constitute the tooth related factors.

Among the various retrieval techniques like ultrasonic tips, drills, extractors, dental operating microscopes, and electrochemical processes, ultrasonic tips were chosen in this scenario 5 due to various advantages in instrument retrieval such as minimal dentin damage and compatible tip designs, which can reach the apical third of the canal. NiTi instruments may undergo further fracture due to heat build-up when ultrasonic devices are used for their retrieval whereas the stainless-steel files do not fracture upon removal with ultrasonics. In case of the SS fragments, they absorb the ultrasonic energy bodily whereas only the point of contact with the tip absorbs the energy in case of NiTi fragments.[3]

Although certain mishaps are unpredictable and cannot be prevented, extra caution should be exercised while performing root canal treatments. Vigilant appraisal of the case and determination of the probable threats should be kept in mind before attempting the removal of the instrument.

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EXPERIENCES OF COVID-19 VACCINATION AMONG DENTAL UNDERGRADUATES AND INTERNS - AN ONLINE CROSS-SECTIONAL SURVEY

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ABSTRACT

Vaccination has been approved as a successful approach in averting the spread of COVID-19. Dental professionals are one among the vulnerable populations due to their close work space proximity related to oral cavity. Our study aimed to assess the experiences of COVID-19 vaccination among dental undergraduates and interns in a tertiary dental health centre in Kerala, India. Among the participants 86.2% were females and 13.8% were males. Most of them (86.2%) never tested positive for COVID-19, but 9.6% were tested COVID positive before the first vaccination. Pain at the injection site was reported as the most common localised symptom after the first doses as well the second dose. Dentists can act as effective advocates of COVID vaccination and evidence-based planning with effective approaches is warranted to enhance the knowledge and eradicate vaccination hesitancy among general public.

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Background:

Vaccination is considered to be one of the most cost effective public health interventions that has a greater impact on reducing the burden of infectious diseases as well as on promoting and maintaining the health. These beneficial health consequences in turn have a significant economic impact on healthcare systems and society as a whole.[1]

Vaccination has been approved as a successful approach in averting the spread of COVID-19.[1,2] Vaccine hesitancy is a continuum amidst vaccine support and denial, which has become a burning issue of public health concern.[3] The success of vaccination greatly depends on people's willingness to receive it. Vaccine uptake can be influenced by a variety of factors, including beliefs that the vaccine causes side effects, perceived susceptibility to illness, knowledge about the vaccine, social influences, and trust in the health system.[4] Additional factors that influence the acceptance of vaccines include their concern about the probable side effects, lack of information, safety of the vaccine, and effectiveness of vaccination against COVID-19.[5]

Understanding the range of symptoms that vaccination might cause is important for the person receiving the vaccine. The symptoms developed after vaccination can vary from pain, redness, and swelling at the injection site, headache, nausea, tiredness, myalgia and fever. Other serious side effects such as anaphylaxis to a vaccine component have been reported.[6]

Although few studies have assessed experiences of COVID vaccination among various health care workers[7,8], no studies have been reported from Kerala, India so far. Dentists and dental students are one among the vulnerable populations due to their close work space proximity related to oral cavity. Hence this study was conducted with an aim to assess the experiences of COVID-19 vaccination among dental undergraduates and interns in a tertiary dental health centre in Kerala, India.

Methodology:

A cross sectional online survey was conducted among undergraduate dental students and interns in a tertiary dental health centre. A convenience sampling methodology was adopted. The sample size was estimated through a pilot study among 20 students, using the formula

$$n=4pq/d^2$$

Where p=proportion of students experienced at least one post vaccination symptom,

q = 1-p, d = allowable error

p - 86%, q= 14%, d=5, n=193

Applying the formula, the minimum estimated sample size was estimated to be 200.

All the students who underwent at least one dose of vaccination and who are willing to participate were included after getting an informed online consent. Data was collected using a pre-validated questionnaire distributed in google form. The questionnaire mainly focussed on the type of vaccine received and post vaccination symptoms.

Data collected in Google Forms was exported to Microsoft Excel file, which was directly imported into IBMSPSS® 24.0 for statistical analysis. (SPSS Inc; Chicago IL, USA). The data was analysed using descriptive statistics.

Results

A total of 203 students participated. Among the participants 86.2% were females and 13.8% were males. [Figure 1]

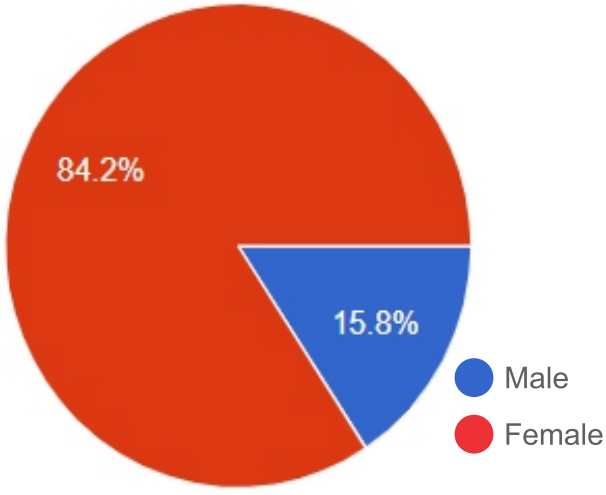

Figure 1.
Distribution of participants based on gender

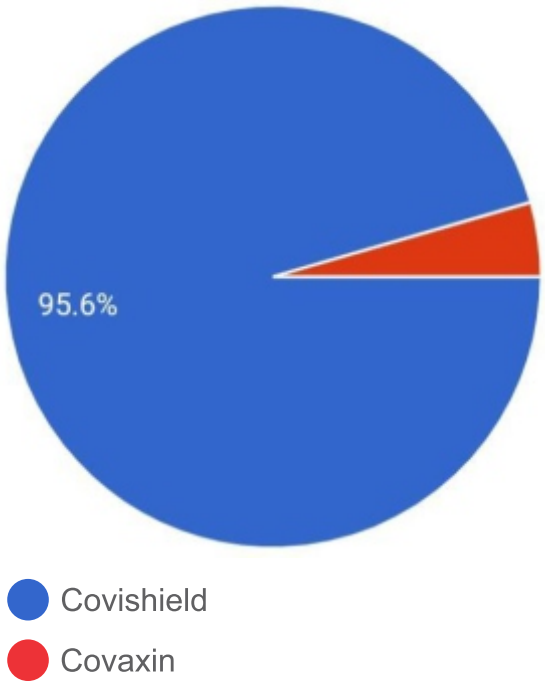

Figure 2. Distribution of participants based on the type of vaccination received

Around 97.6% of the students were vaccinated with Covishield and majority got it done from government institutions. [Figure 2] Most of them (86.2%) never tested positive for COVID-19, but 9.6% were tested COVID positive before the first vaccination. [Figure 3]

About 3% and 0.5% were tested positive for COVID after the first and second doses respectively. Almost 80% of them experienced at least one post vaccination symptom after taking first dose of vaccination but after the second dose only 13.2 % reported of any symptom. Among the various post vaccinations symptoms including fever, pain, chills and fatigue, pain at the injection site was reported as the most common localised symptom after the first doses as well the second dose. [Figure 4 & 5] This finding supports the fact that the majority of the post-COVID-19 vaccination adverse effects are self-limiting, and the recipients recover promptly; none of the symptoms is severe enough to necessitate hospitalization.

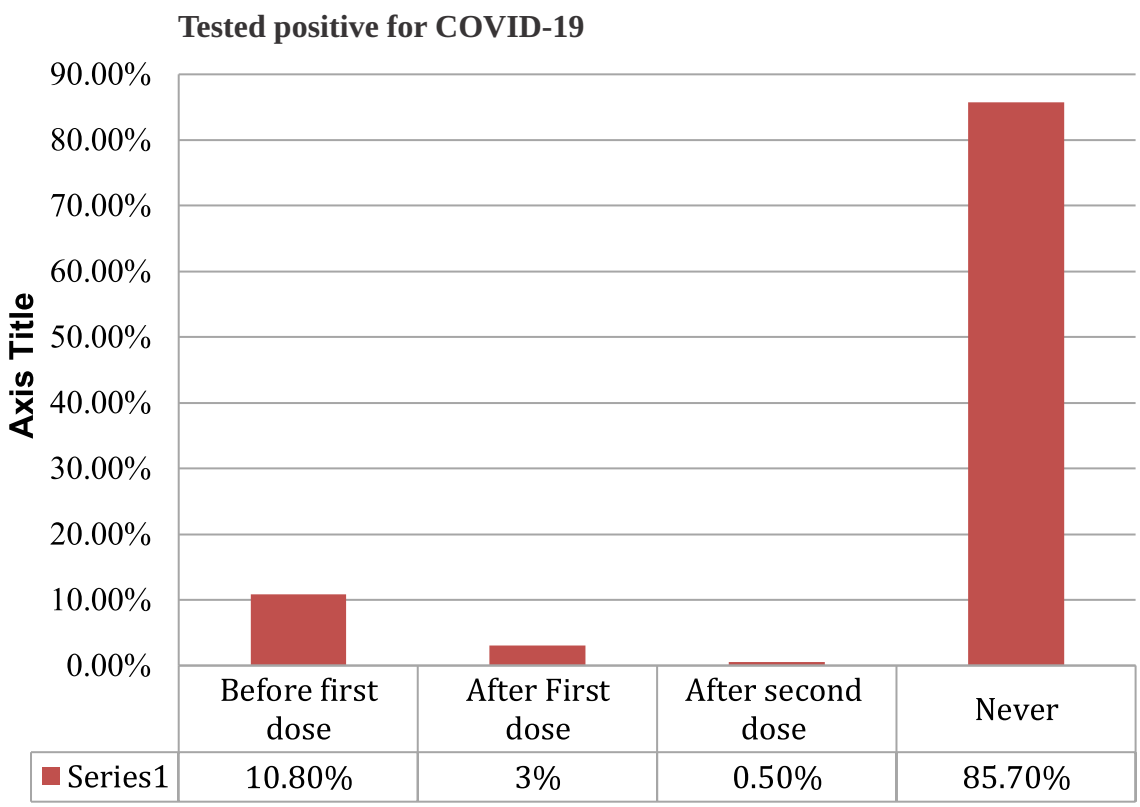

Figure 3: Prevalence of COVID 19 infection among the participants

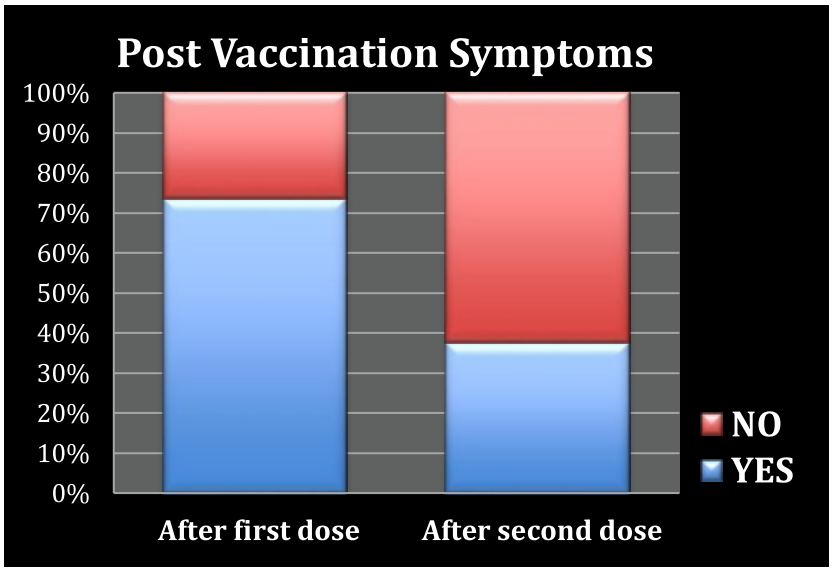

Figure 4 : Prevalence of COVID 19 infection among the participants

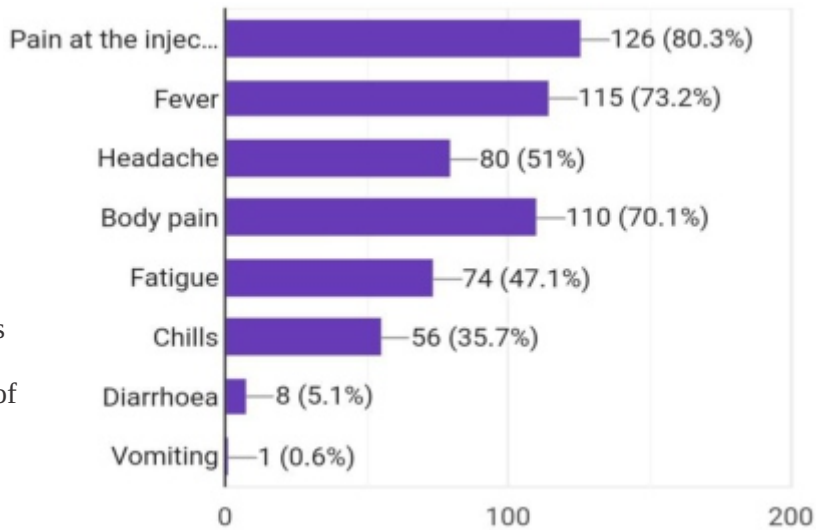

Figure 5:
Distribution of participants based on prevalence of symptoms after first dose of vaccination

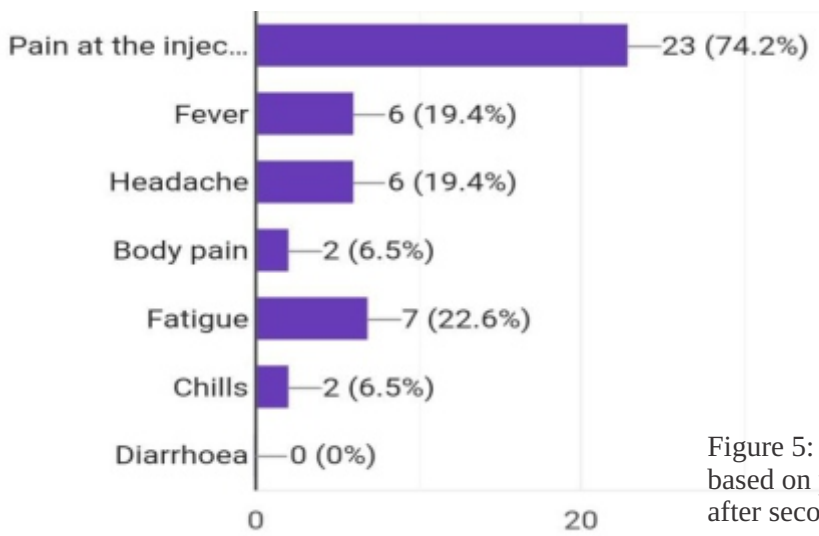

Figure 5: Distribution of participants based on prevalence of symptoms after second dose of vaccination

Discussion:

Dental profession has been ranked one among the highest risk for COVID-19 infection.[9] Studies conducted in U.S. found participants to be more willing to get vaccinated if it would be recommended by their healthcare provider.[10,11] The close proximity of the dental practitioner to his patient during a dental visit and the length of the visit, as well as the documented evidence virus transmission through aerosols and droplets, make dentists more vulnerable to fall into the high-risk category. Also, certain countries have accredited dentists to administer the vaccines to their patients. These points highlight the impact of dentists in accepting COVID-19 vaccination, and functioning as advocates for the vaccines to their patients.[12] Hence the current study was conducted among dental health workers to assess their experiences of vaccination against COVID infection.

Since the development of COVID-19 vaccine, there were concerns about the efficacy, safety and post vaccination adverse effects. Understanding the range of symptoms that vaccination might cause is important for the person receiving the vaccine, for caregivers/decision-makers, and for the healthcare professionals.

In our study among dental graduates and interns, majority of the participants were females which depicted a similar gender representation in the field of dental admissions.

The prevalence of Covishield vaccination was found to be comparable to a study reported, where around 94% were vaccinated with Covishield.[7] Regarding the infection, those tested positive after first (23%) and second dose (73%) were found to be much higher in another study.[7] This could be dependent on the disease prevalence among their patients, time of contact and the extent of personal care measures adopted by the individual.

Generally the side effects of vaccine could be classified as either local or systemic, with its severity fluctuating from mild to moderate. The common discomforts were found to be localised than systemic similar to other studies.[7,8]

The side effects reported in the study were in agreement with those listed by CDC and other studies.[6,7,8]

In the current study, majority of them were mild and non-life threatening, found to be self - resolving without any requirement of hospitalisation.[8] The overall prevalence of side effects was observed to be much lesser when compared to other studies.[7] The most common discomfort was pain at the site of injection. Lowering the patient's arm where injection is given, helps to alleviate this adverse effect. Also, injection into a relaxed muscle causes negligible discomfort compared to that into a tensed one. Vaccines need to be stored at a low temperature as it is reported that injections without acceptable warming may upsurge the possibility of pain at the injection site.[8]

Our study is not free from limitations. The cross sectional nature of the survey in itself carries the inherent biases. Data collection was done at a single tertiary dental care centre, so the results might not be generalizable. Hence an extensive survey on the long term experiences of vaccination based on its influencing factors is recommended to conduct on a wider dentist population.

As a result, contradicting the rumours, misconceptions, and conspiracy theories regarding COVID-19 vaccinations and their real adverse effects could boost public trust and confidence in COVID-19 vaccines.[7]

Conclusion: The study reports that COVID vaccination caused mild self-resolving discomfort among the dental students and interns. The most common discomfort post COVID vaccination was found to be pain at the injection site. Dentists can act as effective advocates of COVID vaccination and evidence-based planning with effective approaches is warranted to enhance the knowledge and eradicate vaccination hesitancy among general public.

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