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Dear Colleagues

Dental education in this country has achieved a lot after the change of guards about a decade ago at the DCI. As a member of the DCI; I have witnessed a sea change in the curriculum and the policies to keep dental education of this country at par with international standards.

But are we really working towards that in our colleges and universities?

To my mind, real education as envisaged by the DCI can be transferred to the dental students if the colleges and the universities follow a set pattern given by the DCI along the length and breadth of the country. That will help us achieve the uniformity of curriculum and minimum competencies required to give a conscientious treatment to the patients by the outgoing passing students.

Along with that there is a need to have comprehensive teacher training programmes to teach the teachers as to how to conduct themselves and reach out to students for attaining those levels of competencies so that a uniform, disciplined, truly trained, real dentist comes out of the institutions which this country can be proud of. A dentist who can feel the pain of the patient, who can deliver the treatment whatever required and who can take the flag of this country on the top of the globe.

Dr. Vikas Jindal

## ACKNOWLEDGMENT

We are grateful to our esteemed referees for having posed faith in us and for contributing positively for this journal. We appreciate the time have taken out for refereeing the articles. It is our attempt to maintain the standard of journal and an attempt to make it reach the international standards

Dr. Vikas Jindal

# CONSERVATIVE APPROACH TO CARIES EXCAVATION - A CHEMO - MECHANICAL METHOD

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**Objective :** The aim of this study was to compare, and evaluate the efficacy of different diagnostic aids for diagnosis of occlusal caries.

**Key words**

Occlusal Lesion. DIAGNOdent. Visual Inspection .Intraoral Camera.

## INTRODUCTION

Dental caries is an infectious microbial disease resulting in dissolution of organic and disintegration of inorganic substance of the tooth. The damage that caries causes leads to pain, discomfort to the patient, loss of tooth structure and further complications if not treated appropriately and at an optimum time. The dental treatment in itself can be very traumatic and apprehensive for the patient because of use of drills and different types of instruments.

The conventional methods utilized the use of hand excavators and mechanical drills (burs at high and low speed). The small and vibratory stimuli generated by conventional rotating instruments are often painful and, in most cases, there is need for local anaesthesia. About 80% of dental patients are estimated to be apprehensive due to the pain/discomfort experienced due to drills used in caries removal. Also since there is an apparent lack of objective clinical markers, it becomes difficult to establish how much dentine should exactly be removed, and often leads to excessive loss of healthy tooth structure.

Cariou dentine can be divided into outer soft, bacteria contaminated caries infected layer which is necrotic, disorganized and non-remineralizable and has to be removed and inner dentine which present little contamination and can be reconstituted by remineralizable and must be preserved. Chemo-mechanical methods remove only outer softened carious

dentine while preserving the underneath healthy dentine and is softer, gentle, and less painful.

## CONCEPT OF MINIMALLY INVASIVE DENTISTRY (MID)

MID is contemporary operative treatment that

incorporates minimally invasive philosophy in cavity design. Considering that operative intervention is the designated treatment for caries removal and restoration, currently available techniques and contemporary materials necessitate a minimally invasive approach to caries excavation. Minimal intervention applied to the operative field keeps the options open for long term preservation of the restored tooth.<sup>2</sup>

In the current scenario, the focus is mainly on maximum conservation of demineralized, non-cavitated enamel and dentine. Once infection is controlled, caries risk status and evidence of lesion demineralization can be monitored over extended periods.<sup>3</sup> Minimal invasive approach to treat dental caries involves mainly detection, diagnosis, interception, and treatment of dental caries on the microscopic level.<sup>4</sup> MID for treatment of dental caries include non-surgical conservative modalities and a key concept that dental caries should be treated as infectious disease. The use of chemo-mechanical caries removal system is desired to remove adequate quantities of carious dentine and at the same time preserve healthy dental tissues.<sup>5,6</sup>

## A UNIQUE CARIES REMOVAL SYSTEM

(Fig-1)



A new chemo-mechanical method of caries removal based on MID concept. It is a two paste system consisting of gel of high viscosity, containing three

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amino acids, and a transparent fluid containing 0.5% sodium hypochlorite.

Tube A	Tube B
5% Sodium	Amino Acid like glutamic acid, Lysine, Leucin
Hypochlorite	Sodium Chloride
	Erythrosine,
	Carboxymethylcellulose, Water
	Sodium Hydroxide

### MECHANISM OF ACTION

It is a gel based method for caries excavation which is minimally invasive and offers treatment with minimum pain and better preservation of teeth. It is effective due to its action on only the carious part of the tooth in contrast to conventional method of drilling, which removes both the infected and affected dentin, resulting in excessive loss of healthy tooth structure.

When it comes in contact with caries, it releases chlorine which has detrimental action on the collagen fibrils. This makes the caries soft which can be scraped out. The process is repeated until no carious debris is found when scraped.<sup>7</sup>

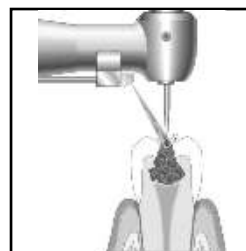
Amino acids effectively interact with the dentine by acting on different protein chains of denatured collagen and by enhancing the effect of sodium hypochlorite on carious dentine. Additionally, the amino acids also neutralize the action of the agent on healthy tissue and prevent degradation of healthy collagen. According to Inaba et al<sup>8</sup>, since it is made of sodium hypochlorite and is a proteolytic agent, it allows more effective removal of organic components, leading to rupture of hydrogen bonds in the dentinal collagen fibres previously degraded by the demineralization process of caries. Consequently, this rupture softens the tissue and reduces the pressure required for removal by attrition.<sup>9</sup>

This method does allow for better control when compared to removal by burs which lead to large amounts of dentine removal in blocks, and have a higher possibility of pulp exposure. Chemically, it softens the carious dentin while leaving the healthy dentine unaffected. It can be used in combination with drill in condition when the cavity needs to be opened up, to adjust the periphery of the cavity, whenever there are large amount of caries or when the risk of affecting healthy tissues or the pulp is minimal.<sup>10</sup>

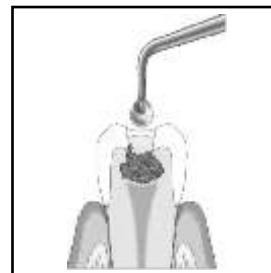
Further, this enables to avoid drilling deep into the cavity, as the instruments are designed to scrap in two or in several directions, which reduces the friction during caries excavation.<sup>10</sup>

### TECHNIQUE OF USING CARISOLV

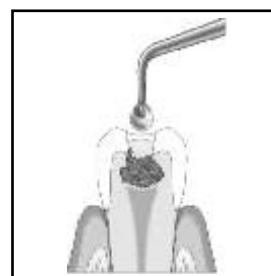
- 1 The syringes are held with their openings upwards. Remove the caps, keep the syringes upright and screw them together. Mix the liquids until the liquids are homogenous and apply it to the cavity.
2. Drilling, when the cavity needs to be opened up, for adjustment of cavity periphery and when there are large amounts of caries and the risk to affect healthy tissue is minimal.(fig-2)



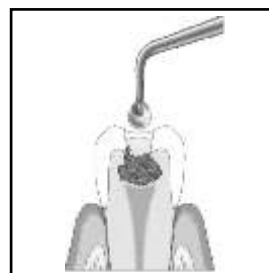
3. A drop of the gel is removed with an instrument and applied to the carious dentine. (Fig-3)



4. Let the chemistry work for at least 30 seconds.
5. Scrape the superficial softened carious dentine with hand instrument. Then continue to work carefully using scraping or rotating movements. The gel is not intended to be used in direct contact with the pulp tissues. (Fig-4)

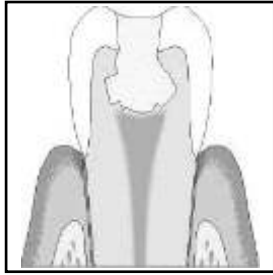


6. Remove the softened carious dentine with the instrument. Avoid flushing or drying the cavity.
7. Gradually add new gel and continue scraping. Repeat the procedure until the gel is no longer cloudy and the surface feels hard. (Fig-5)



8. If the cavity feels free from caries, remove the gel and wipe the cavity with the moistened cotton pellet and check it with a sharp probe. (fig-6)





9. If the cavity is not free from caries, apply new gel and continue scraping.
10. Adjust the periphery of the cavity with a hand instrument or a drill. Restore the tooth with a suitable filling material.
11. Once the gel is mixed, its effect will begin to decline after about 30 minutes. Any gel that is left over should be destroyed.

### SUMMARY

A new chemo-mechanical gel based method for caries treatment which is minimally invasive and offers treatment with considerable pain reduction and better preservation of teeth due to its action on only the carious part of the tooth in contrast to conventional method by drilling, which removes both the infected and unaffected dentin, resulting in excessive loss of healthy tooth structure. Chemically, it softens the carious dentin while leaving the healthy dentine unaffected. So it can be used in combination with drill. Drilling can be used whenever the cavity needs to be open up, to adjust the periphery of the cavity or whenever there are large amount of caries or when the risk of affecting healthy tissues or the pulp is minimal.

### ACKNOWLEDGEMENT

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### REFERENCES

1. Various methods of caries removal in children: a comparative clinical study. *J Indian Soc Pedod Prev Dent.* 2007 Apr-Jun;25(2):93-6.
2. Peters MC, McLean ME. Minimally invasive operative care. Contemporary techniques and materials: an overview. *J Adhes Dent* 2001; 3(1): 17-31.
3. Kakaboura A, Masouras C, Staikov O et al. A comparative clinical study on the carisolv caries removal method. *Quintessence Int* 2003; 34: 269-71.
4. Tyas MJ, Anusavice KJ, Frencken JE et al. Minimal intervention dentistry: a review. *FDI Commission Project 1-97. Int Dent J* 2000; 50(1): 1-12.
5. Banerjee A, Kidd EAM : In vitro evaluation of five alternate methods of carious dentine excavation. *Caries Res* 2000;34:144-150.
6. Chaussain-Miller, Decup F et al: Clinical evaluation of carisolv chemi-mechanical caries removal technique according to site concept. *Clin oral Invest* 2003;7:32-37.
7. Beeley JA, Yip HK, Sterenson AL. Chemomechanical caries

removal: a review of the technique and latest developments. *Br Dent J* 2000; 188: 427-430.

8. Inaba D, Duschner N, Jongebloed W et al. The effect of a sodium hypochlorite treatment on demineralized root dentine. *Eur J Oral Sci* 1995; 103(6): 368-74.
9. Petruzillo MA, McNierney HD. Chemomechanical caries removal system in pediatric dentistry. *NY State Dent J* 1998; 54(2): 29-32.]
10. Giza S et al. Comparative studies of carious defects filling using the classical method and dental drill, and using the Carisolv chemomechanical method and the YAG:Er CTL-1601 laser. *Ann Acad Med Stetin.* 2007;53(3):88-99.
11. Ericson D, Bornstein R. Development of a tissue preserving agent for caries removal. In: *Tissue Preservation in Caries Treatment.* Albrektsson J. Survey: Quintessence; 2001. p.153-166.

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# IS IT WISDOM TO REMOVE A WISDOM TOOTH? - Extraction versus nonextraction Management of Impacted Tooth

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## Abstract

Prophylactic removal of impacted third molar is the most commonly practiced dental procedure. The indications for removal of asymptomatic impacted third molar have been challenged in recent years. Decisions regarding this question not only should consider the presence of ongoing symptoms or pathology but also anticipate future complications & morbidity associated with retention of the third molars and possible increased risk of extraction at an older age. In this paper we present the currently available evidence against & in support of the prophylactic removal of impacted third molars.

## Key words

Wisdom tooth, prophylactic removal, third molar

## INTRODUCTION

Prophylactic removal of impacted third molar is most commonly dispensed procedure in our day to day practice. According to the American Association of Oral and Maxillofacial Surgeons, "if there is insufficient anatomical space to accommodate normal eruption, removal of such teeth at an early age is a valid and scientifically sound treatment rationale based on medical necessity."<sup>1</sup> As a result, 10 million teeth classified as impactions (teeth that fail to erupt into normal position but remain fully or partially embedded and covered by jawbone or gum tissue) are removed every year from mostly healthy young people.<sup>2</sup>

There are wide variations in rates of third molar surgery.<sup>3,4</sup> There is also some evidence that deprived populations with poor dental health are less likely to have third molars removed than more affluent populations with good dental health.<sup>3,5</sup> However, the reasons for this are complex. Recently indications for the removal of asymptomatic impacted third molar have been challenged. This controversy has initiated the search for evidence based data to justify this practice.

Several reasons are given for the early removal of asymptomatic or pathology-free impacted third molars, almost all of which are not based on reliable evidence: they have no useful role in the mouth; they may increase the risk of pathological changes and symptoms; and if they are removed only when pathological changes occur, patients may be older and the risk of serious complications after surgery may be greater.

On the other hand, the probability of impacted third molars causing pathological changes in the future

may have been exaggerated.<sup>6,7</sup> Many impacted or unerupted third molars may eventually erupt normally and many impacted third molars never cause clinically important problems.<sup>8</sup> In addition, third molar surgery is not risk free; the complications and suffering following third molar surgery may be considerable.<sup>9</sup> Therefore, prophylactic removal should only be carried out if there is good evidence of patient benefit. Third-molar surgery is a multibillion-dollar industry that generates significant income for the dental profession, particularly oral and maxillofacial surgeons. It is driven by misinformation and myths that have been exposed before but that continue to be promulgated by the profession.

## MYTH NUMBER 1—THIRD MOLARS HAVE A HIGH INCIDENCE OF PATHOLOGY

Not more than 12% of impacted teeth have associated pathology. This incidence is the same as for appendicitis (10%) and cholecystitis (12%), yet prophylactic appendectomies and cholecystectomies are not the standard of care.<sup>10</sup> Why then prophylactic third-molar extractions?

Pericoronitis (inflammation of the gingival surrounding the crown of a tooth) is the most common indication for third molar surgery,<sup>11</sup> and mainly occurs in adolescents and young adults but less commonly in older people.<sup>12</sup> A study reported that over 4 years of follow up, 10% of lower third molars develop pericoronitis.<sup>13</sup>

Very few impacted third molars cause dental caries (decay) of second molars,<sup>12</sup> though estimates vary (1% to 4.5%).<sup>9</sup> Fear of second molar caries is not a justification for prophylactic removal.

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There is a low incidence (less than 1%) of root resorption of second molars with impacted third molars.<sup>13</sup> One review concludes that the risk of second molar root resorption by impacted third molars is low, and is likely to occur in younger patients for whom surgery is claimed to be associated with less morbidity.<sup>12</sup>

Many dentists confuse the incidence of pathology as it shows up in their offices with its prevalence in the population. Advocacy of prophylactic extractions that is based on anecdotal experience (i.e., patients with diseased third molars who make dental appointments) exaggerates the problem and exposes millions of people to the risk of iatrogenic injury. Considering the low prevalence of third-molar pathology in the population, removal of asymptomatic, nonpathologic third molars does not meet the standard of evidence-based practice.

#### **MYTH NUMBER 2—EARLY REMOVAL OF THIRD MOLARS IS LESS TRAUMATIC**

The American Association of Oral and Maxillofacial Surgeons states that “about 85% of third molars will eventually need to be removed.”<sup>14</sup> The association recommends extraction of all 4 third molars by young adulthood—preferably in adolescence, before the roots are fully formed—to minimize complications such as postextraction pain and infection.

Early removal of third molars is actually more traumatic and painful than leaving asymptomatic, nonpathologic teeth in situ. Tulloch et al. estimate that patients suffer an average of 2.27 days of standard discomfort or disability, defined as “the disability normally associated with an uncomplicated surgical extraction of a mandibular third molar: namely, pain, swelling, bruising and malaise.”<sup>15</sup> Furthermore, dry socket, secondary infection, and paresthesia are less likely to occur in persons aged 35 to 83 years than in those aged 12 to 24 years, who experience more third-molar extractions. The highest risk of complication is in persons aged 25 to 34 years.<sup>16</sup>

When a lower third molar is removed, usually the opposing upper third molar is also removed. Assuming an average of 2 extractions per episode, the 10 million third molars extracted annually involve 5 million people and 11.36 million days of standard discomfort or disability. If only the 20% of wisdom teeth with pathology were extracted, 4 million people would be spared pain, swelling, bruising, malaise, and consequent absence from school or work—an aggregate decrease of 9 million days of discomfort and disability each year. Allowing for some margin of error and for the fact that one third of third molars are reported to cause some symptoms in the past or present, if only 33% were extracted, 3.34 million people would still be spared an average of 2.27 days of discomfort and disability each, or 7.6 million days of discomfort and disability in the aggregate.

#### **Myth Number 3—Pressure of Erupting Third Molars Causes Crowding of Anterior Teeth**

Most young adults experience some degree of anterior mandibular incisor crowding, usually coinciding with the emergence of the third molar. In 1996, Richardson<sup>17</sup> conducted a review of literature that conducted that pressure from the posterior arch is an important cause of late mandibular incisor crowding. Among the many possible variables contributing to incisor crowding (e.g. physiological mesial drift, occlusal forces on mesially inclined teeth, mesial vector of muscle contraction, developing third molar, mandibular and complex facial growth patterns, soft tissue maturation, occlusal factors and connective tissue changes), it becomes difficult to design a study that can isolate all variables and demonstrate a cause and effect relationship between mandibular third molar and incisor crowding.<sup>18</sup> Third molars do not possess sufficient force to move other teeth.

They cannot cause crowding and overlapping of the incisors, and any such association is not causation.<sup>19-21</sup>

#### **Myth Number 4—The Risk of Pathology in Impacted Third Molars Increases With Age**

The American Association of Oral and Maxillofacial Surgeons states, without substantiation, “Pathologic conditions [of impacted third molars] are generally more common with an increase in age”<sup>1</sup> Cyst development is very rare (less than 0.8%)<sup>22</sup> and is not an indication for prophylactic removal.<sup>12</sup> The risk of malignant neoplasms arising in a dental follicle is negligible and is not an indication for prophylactic removal.<sup>12</sup>

#### **Myth Number 5—There is Little Risk of Harm in the Removal of Third Molars**

Given the low incidence of pathology, it is specious to contend that less than 3 days of temporary discomfort or disability is a small price to pay to avoid the future risks of root resorption, serious infections, and cysts. Also ignored is the risk of incidental injury such as broken jaws, fractured teeth, damage to the temporomandibular joints, temporary and, especially, permanent paresthesia or dyesthesia (numbness and dysfunction of the lower lip and the tongue)

#### **PROPHYLACTIC REMOVAL: IS IT JUSTIFIED?**

In a comparison of the risk of pathological changes in retained third molars and complications after third molar surgery, the complications after removing third molars includes risk of lingual nerve injury (0.6-2%)<sup>23</sup>, inferior alveolar nerve injury (0.5-5%)<sup>23</sup>, Periodontal defect distal to second molar and increased chances of condylar fracture.<sup>24</sup>

But there are certain evidences also available in support of prophylactic removal of third molars. The benefits of early extraction includes reduces the incidences of mandibular angle fracture, <sup>25</sup> eliminates the need for future extensive surgeries and improvement in the periodontal health around the second molar.<sup>26</sup>

One school of thought is endorsed by oral and maxillofacial surgeons who contend that most third molars are potentially pathologic and should be removed. On the contrary the British National Institute for Clinical Excellence is unequivocal in its recommendation, adopted by the National Health Service: “The practice of prophylactic removal of pathology-free impacted third molars should be discontinued There is no reliable evidence to support a health benefit to patients from the prophylactic removal of pathology-free impacted teeth.”<sup>27</sup> The conditions for which extraction is justified include nonrestorable dental caries, pulpal infection, cellulitis, recurrent pericoronitis, abscesses, cysts, and fractures

As it is not possible to predict reliably whether impacted third molar will develop pathological changes if they are not removed. In the absence of good evidence to support prophylactic removal, there appears to be little justification for the routine removal of pathology free impacted third molars.

#### **CONCLUSION**

Surgical removal of third molars can only be justified when clear long term benefit to the patient is expected. But there are more randomised controlled studies required to compare the long term outcome of early removal with retention of pathology free third molars. So there is always no wisdom in removing a wisdom tooth.

## CONFLICTS OF INTEREST STATEMENT

None

## SOURCE OF SUPPORT

None

## LIST OF REFERENCES

1. Statements by the American Association of Oral and Maxillofacial Surgeons Concerning the Management of Selected Clinical Conditions and Associated Clinical Procedures: The Management of Impacted Third Molar Teeth. Rosemont, Ill: American Association of Oral and Maxillofacial Surgeons; 2007.
2. American Dental Association. 1999 survey of dental services rendered [unpublished report]. ADA Catalog No. SDSR-1999.
3. Landes, D. P. The relationship between dental health and variations in the level of third molar removals experienced by populations. *Community Dental Health* 1998; 15L:67-71
4. Toth, B. The Appropriateness of Prophylactic Extraction of Impacted Third Molars. A Review of the Literature. Health Care Evaluation Unit, University of Bristol, 1993.
5. Gilthorpe, M. S., Bedi, R. An exploratory study combining hospital episode statistics with socio-demographic variables, to examine the access and utilisation of hospital oral surgery services. *Community Dental Health* 1997; 14(4): 209-213
6. Shepherd JP, Brickley M. Surgical removal of third molars. *British Medical Journal* 1994; 309: 620-621.
7. Stephens RG, Kogon SL, Reid JA. The unerupted or impacted third molar - a critical appraisal of its pathologic potential. *J Canad Dental Assoc* 1989; 55(3): 201-207.
8. Ahlqvist M, Grondahl HG. Prevalence of impacted teeth and associated pathology in middle-aged and older Swedish women. *Comm Dent Oral Epidem* 1991; 19(2): 116-119.
9. Mercier P, Precious D. Risks and benefits of removal of impacted third molars. *Intl J Oral Maxillofac Surg* 1992; 21: 17-27
10. Leonard MS. Removing third molars: a review for the general practitioner. *J Am Dent Assoc.* 1992; 123:77-92.
11. Worrall SF, Riden K, Haskell R, Corrigan AM. UK National Third Molar project: the initial report. *Brit J Oral Maxillofac Surg.* 1998; 36(1):14-18
12. Daley TD. Third molar prophylactic extraction: a review and analysis of the literature. *General Dentistry* 1996; 44(4): 310-320.
13. Von Wowern N, Nielsen HO. The fate of impacted lower third molars after the age of 20. A four-year clinical follow-up. *Int J Oral Maxillofac Surg* 1989; 18(5): 277-280.
14. Wisdom teeth [pamphlet]. Rose-mont, Ill: American Association of Oral and Maxillofacial Surgery; 2005
15. Tulloch JFC, Antczak-Bouckoms AA, Ung N. Evaluation of the costs and relative effectiveness of alternative strategies for the removal of mandibular third molars. *Int J Technol Assess Health Care.* 1990;6:505-515.
16. Osborn TP, Frederickson G, Small IA, Torgerson TS. A prospective study of complications related to mandibular third molar surgery. *J Oral Maxillofac Surg.* 1985;43:767-769.
17. Richardson ME. The etiology of late lower arch crowding alternative to mesially directed forces. *Am J Orthod Dentofacial Orthod* 1994; 105: 592-7.
18. Richardson ME. Late lower arch crowding in relation to skeletal and dental morphology and growth changes. *Br J Orthod* 1996; 23:249-54.
19. Southard TE. Third molars and incisor crowding: when removal is unwarranted. *J Am Dent Assoc.* 1992;123: 75-79.
20. Kaplan RG. Mandibular third molars and post-retention crowding. *Am J Orthodont.* 1974;66:411-430.
21. Harradine NW, Pearson MH, Toth B. The effect of extraction of third molars on late lower incisor crowding: a randomized controlled trial. *Br J Orthodont.* 1998;25:117-122
22. Stanley HR, Alattar M, Collett WK, Stringfellow HR, Spiegel EH. Pathological sequelae of "neglected" impacted third molars. *J Oral Pathol.* 1988;17:113-117
23. Alling CC III. Dysesthesia of the lingual and inferior alveolar nerves following third molar surgery. *J Oral Maxillofac Surg* 1986; 44:454.
24. Zhu SJ, Chi BH, Kim HJ et al. Relationship between the presence of unerupted mandibular third molar and fractures of the mandibular condyles. *Int J Oral Maxillofac Surg* 2005; 34: 382-5.
25. Sadfar N, Meechan JG. Relationship between fractures of the mandible angle and presence and state of eruption of the lower third molars. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995; 79: 680-4.
26. Richardson DT, Dodson TD. Risk of periodontal defects after third molar surgery: an exercise in evidence-based clinical decision making. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005; 100(2):133-7.
27. National Institute for Clinical Excellence. Guidance on the extraction of wisdom teeth. 2000. Available at: [www.nice.org.uk](http://www.nice.org.uk). Accessed June 14, 2007

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# PAIN CONTROL DURING ORTHODONTIC TREATMENT: A CLINICIAN PROSPECTIVE

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## Abstract

Orthodontic tooth movement is facilitated by remodelling of the paradental tissues in response to mechanical forces. Osteoclast and osteoblast cells mediate bone resorption and opposition, which eventually produces tooth movement. Patients undergoing orthodontic treatment can experience hyperalgesia due to the release of noxious agents from nerve endings. NSAIDs remain the most preferred method for pain control during orthodontics. The objective of this review is to outline the mechanism of action and effects of these drugs on orthodontic tooth movement. This is considered essential in order for the orthodontist to take into account all factors related to the therapy and to select the best therapeutic strategy in every individual patient keeping the mechanics as simple as possible and follow an appropriate protocol for administration of these drugs.

## Key words

Orthodontic tooth movement, osteoclast, osteoblast, hyperalgesia, NSAIDs.

## INTRODUCTION

Orthodontics is based on the original discovery by Celsus that pressure applied to a tooth will cause it to change its position.<sup>1</sup> As defined by Profit, orthodontic tooth movement is the result of a biological response to interference in the physiological equilibrium in the dentofacial complex by an externally applied force.<sup>2</sup> The sequence of events occurring as part of the tooth movement process involves synthesis, release, as well as the role of various inflammatory mediators, neurotransmitters, growth factors and other cytokines in response to applied mechanical forces.<sup>3</sup> These endogenous molecules play important roles in the initiation, maintenance and cessation of tooth movement. Some of these factors can also cause undesirable side effects, such as pain and root resorption.<sup>4</sup> Control of this pain is of interest to both clinician and patients. The aim of this overview is to update clinician concerning the mechanism of action; effects of some commonly used pharmaceutical products that control pain during orthodontic treatment.

## DISCUSSION

Pain is an unpleasant, sensory and emotional experience associated with an actual or potential damage or described in terms of such damage.<sup>5</sup> Orthodontic tooth movement basically involves the coupling effect of bone remodelling – resorption and deposition resulting in a painful experience for the patients.<sup>6</sup> Orthodontic procedures resulting in pain are orthodontic separation, appliance therapy, activation of arch

wires, orthopaedic forces and debonding. Pain associated with orthodontic treatment usually begins 2 hours after the insertion or activation of an appliance and lasts for approximately 5 days.<sup>7</sup> Initial type of pain after appliance activation is due to the compression of the periodontal ligament followed by release of prostaglandins causing hyperalgesia due to release of noxious agents such as histamine, bradykinin, serotonin, acetylcholine and substance P from nerve endings both peripherally and centrally.<sup>6</sup>

The non-steroidal anti-inflammatory drugs (NSAIDs) are the most frequently used and the drug of choice for the control of pain following mechanical force application to teeth. They act primarily on peripheral pain mechanisms but also in CNS to raise pain threshold, by inhibiting the enzyme cyclo-oxygenase (COX), which modulates the transformation of prostaglandins (PGs) from arachidonic acid in the cellular plasma membrane. These drugs are classified as:

- a) Non selective COX inhibitors (traditional NSAIDs)
  - 1) Salicylates: Aspirin
  - 2) Propionic acid derivatives: Ibuprofen, naproxen
  - 3) Anthranilic acid derivative: Mephenamic acid
  - 4) Aryl-acetic acid derivatives: Diclofenac, Aceclofenac
  - 5) Oxamic derivatives: Piroxicam, Tenoxicam
  - 6) Pyrrolo-pyrrole derivative: Ketorolac
  - 7) Indole derivative: Indomethacin
  - 8) Pyrazolone derivatives: Phenylbutazone, Oxyphenbutazone
- b) Preferential COX-2 inhibitors  
Nimesulide, Meloxicam, Nabumetone
- c) Selective COX-2 inhibitors

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Celecoxib, Parecoxib

d) Analgesic-antipyretics with poor anti-inflammatory action

- 1) Paraaminophenol derivative: Paracetamol (Acetaminophen)
- 2) Pyrazolone derivatives: Metamizol
- 3) Benzoxazocine derivative: Nefopam.5

NSAIDs reduce the pain and discomfort caused by orthodontic tooth movement but these drugs may also effect the sequence of tooth movement by inhibiting or at least reducing the associated inflammatory and bone resorption process.<sup>8</sup> Because prostaglandins appear to be important in the process of tooth movement, it has been suggested that the use of over-the-counter NSAIDs by orthodontic patients can significantly alter the efficacy of tooth movement.<sup>9</sup>

Amongst the earliest studies carried out Chumbley et al evaluated the effect of indomethacin (an aspirin like drug) and recommended that aspirin like drugs not to be administered to patients undergoing orthodontic treatment as it may extend the treatment time.<sup>10</sup> Kehoe et al had proven that acetaminophen remains an appropriate alternative to NSAID'S which did not affect orthodontic tooth movement. But in a recent study Bradley et al compared ibuprofen and paracetamol for the control of pain and found that pre-operative and post-operative ibuprofen to be more effective than paracetamol.<sup>11</sup>

Other alternative is the use of selective cox-2 inhibitors, also called coxibs. In comparison to NSAID's, Cox-2 inhibitors have longer dose intervals, different side effect profile, similar onset of action and similar analgesic effect. These drugs selectively block the COX-2 enzyme, and impede the production of the chemical messengers (PGs) that cause pain and swelling. Because these drugs selectively block the COX-2 enzyme and not the COX-1 enzyme, these drugs are uniquely different from traditional NSAIDs. <sup>12</sup> Carlos et al evaluated orthodontic tooth movement after different coxib therapies and concluded that celecoxib and parecoxib but not rofecoxib, seem appropriate for discomfort and pain relief while avoiding interference during tooth movement.<sup>13</sup>

Gameiro et al evaluated the effects of short and long term celecoxib on orthodontic tooth movement and concluded that although celecoxib, administration did not effect the number of osteoclasts, the osteoclasts activity might be reduced which could explain the inhibition of tooth movement observed.<sup>13</sup> According to a recent report nabumetone, a drug belonging to the NSAID group reduces the amount of root resorption along with the control of pain from intrusive orthodontic forces, without affecting the pace of tooth movement.<sup>14</sup>

The current trend is directed towards use of preemptive or pre-operative analgesics, which are administered at least one hour before every orthodontic procedure. Preemptive analgesic administration to decrease post-operative pain has become the focus of recent research in orthodontics. Pre-emptive analgesia will block the afferent nerve impulses before they reach the central nervous system, abolishing the process of central sensitization. <sup>15</sup> Acetaminophen, which does not have a significant influence on the rate of tooth movement, can be recommended for controlling pain during orthodontic treatment.<sup>8</sup>

Apart from analgesics, other approaches have been tested to reduce pain from orthodontic procedures. Chewing gum or a plastic wafer during first few hours of appliance activation in order to reduce pain has been suggested. This will temporarily displace the teeth sufficiently to allow blood to flow through compressed areas preventing a build up of metabolic products.<sup>3</sup>

#### CONCLUSION:

Pain is common during orthodontic therapy and is largely unavoidable due to the nature of the tissue reaction to the physiology of tooth movement and the soft tissue insult resulting from the contemporary appliances. Analgesics that are commonly

recommended have been shown to effect tooth movement to a degree. Improved clinical technique, limiting the forces and careful adjustments all contribute to reducing the pain experience as well as providing information about the anticipated or ongoing treatment can give a sense of control<sup>Z</sup>

#### REFERENCES

1. Salzmann JA. Practice of Orthodontics.
2. Proffit WR, Fields HW, Sarver DM. Contemporary orthodontics. IV edition
3. Krishnan V, Davidvitch Z. The effects of drugs on orthodontic tooth movement. *Orthod Craniofac Res* 2006; 4: 163-171.
4. Krishnan V, Davidovitch Z, Cellular, molecular and tissue level reactions to orthodontic force. *Am J Ortho* 2006; 129: 469e; 1-460
5. Tripathi KD. Essentials of Medical Pharmacology, V edition.
6. Khan R, Antony VV. The role of drugs in orthodontic tooth movement. *Indian Dentist Research and Review* 2009; 4: 28-32.
7. Paulose J. Pain control during orthodontic therapy. *Indian Dentist Research and Review* 2009; 4: 56-58.
8. Gamerio GH, Pereira-Neto JS, Magnani MB, Nouer DF. The influence of drugs and systemic factors on orthodontic tooth movement. *J Clin Orthod* 2007; 2: 73-78
9. Krishnan V. Orthodontic pain: from causes to management –a review. *Eur J Orthod* 2007; 29: 170-179.
10. Chumbley AB, Orhan CT. The effect of indomethacin on the rate of orthodontic tooth movement. *Am J Orthod* 1986; 89: 312-314.
11. Juneja P, Shivaprakash G, Kambalyal PB. An overview of the role of drugs and systemic factors on orthodontic tooth movement. *JIOS* 2008; 42: 36-47.
12. Gameiro GH, Nouer DF, NetoJSP, Siqueira VC, Andrade ED, Novaes PD, Veiga MCF. Effects of short and long term celecoxib on orthodontic tooth movement. *Angle Orthod* 2008; 78 (5): 860-865.
13. De Carlos, Cobo J, Perillon C, Gareja MA, Arquelles J, Vijande M, Costales M. Orthodontic tooth movement after different coxib therapies. *Rur J Orthod* 2007 29 (6): 596-9.
14. Gurton AU, Akin E, Sagdic D, Olmez H. Effects of PGI2 and TxA2 analogs and inhibitors in orthodontic tooth movement. *Angle Orthod* 2004; 74: 526-32.
15. Bernhardt MK, Southard KA, Batterson KD, Logan HL, Baker KA, Jakobsen JR. The effect of preemptive and/postoperative ibuprofen therapy for orthodontic pain. *Am J Orthod Dentofacial Orthop* 2001; 120: 20-27.

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1. Salzmann JA. Practice of Orthodontics.

2. Proffit WR, Fields HW, Sarver DM. Contemporary orthodontics. IV edition
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  4. Krishnan V, Davidovitch Z, Cellular, molecular and tissue level reactions to orthodontic force. *Am J Ortho* 2006; 129: 469e; 1-460
  5. Tripathi KD. Essentials of Medical Pharmacology, V edition.
  6. Khan R, Antony VV. The role of drugs in orthodontic tooth movement. *Indian Dentist Research and Review* 2009; 4: 28-32.
  7. Paulose J. Pain control during orthodontic therapy. *Indian Dentist Research and Review* 2009; 4: 56-58.
  8. Gameiro GH, Pereira-Neto JS, Magnani MB, Nouer DF. The influence of drugs and systemic factors on orthodontic tooth movement. *J Clin Orthod* 2007; 2: 73-78
  9. Krishnan V. Orthodontic pain: from causes to management –a review. *Eur J Orthod* 2007; 29: 170-179.
  10. Chumbley AB, Orhan CT. The effect of indomethacin on the rate of orthodontic tooth movement. *Am J Orthod* 1986; 89: 312-314.
  11. Juneja P, Shivaprakash G, Kambalyal PB. An overview of the role of drugs and systemic factors on orthodontic tooth movement. *JIOS* 2008; 42: 36-47.
  12. Gameiro GH, Nouer DF, NetoJSP, Siqueira VC, Andrade ED, Novaes PD, Veiga MCF. Effects of short and long term celecoxib on orthodontic tooth movement. *Angle Orthod* 2008; 78 (5): 860-865.
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  14. Gurton AU, Akin E, Sagdic D, Olmez H. Effects of PGI2 and TxA2 analogs and inhibitors in orthodontic tooth movement. *Angle Orthod* 2004; 74: 526-32.
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12. Gameiro GH, Nouer DF, NetoJSP, Siqueira VC, Andrade ED, Novaes PD, Veiga MCF. Effects of short and long term celecoxib on orthodontic tooth movement. *Angle Orthod* 2008; 78 (5): 860-865.
  13. De Carlos, Cobo J, Perillon C, Gareja MA, Arquelles J, Vijande M, Costales M. Orthodontic tooth movement after different coxib therapies. *Rur J Orthod* 2007 29 (6): 596-9.
  14. Gurton AU, Akin E, Sagdic D, Olmez H. Effects of PGI2 and TxA2 analogs and inhibitors in orthodontic tooth movement. *Angle Orthod* 2004; 74: 526-32.
  15. Bernhardt MK, Southard KA, Batterson KD, Logan HL, Baker KA, Jakobsen JR. The effect of preemptive and/postoperative ibuprofen therapy for orthodontic pain. *Am J Orthod Dentofacial Orthop* 2001; 120: 20-27.

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## Comparison Of The Clinical Effectiveness Of Iontophoresis Versus Iontophoresis Combined With Coronally Repositioned Flap In The Management Of Hypersensitivity On Exposed Root Surfaces

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### INTRODUCTION

Gingival recession, often called as tooth root exposure, is the denudation of the tooth root surface due to apical movement of gingiva<sup>1</sup>. As a result, there is wearing away of cementum, thereby exposing the underlying dentinal surface to the oral environment. Dentin exposure can also occur as a result of erosion, abrasion, attrition, hypoplastic enamel, defective restorations, improperly developed cemento-enamel junction, caries, cracked tooth syndrome, trauma etc. Consequently, tooth hypersensitivity develops, which is described clinically as an exaggerated response to a non-noxious sensory stimulus<sup>2</sup>. According to Wycoff, dental hypersensitivity is a painful response of a tooth to irritants such as tooth brushing, sweet and sour foods and thermal changes. It is a potential threat to individual's oral health because such pain may interfere with maintenance of good oral hygiene<sup>3</sup>.

A variety of treatment modalities have been tried to overcome hypersensitivity with variable success<sup>4</sup> such as burnishing of exposed root surface to form a smear layer, topical application of agents that form insoluble precipitates, impregnation of tubules with plastic resins and application of dentine bonding agents to seal off the tubules. One such treatment procedure is to use desensitizing agents along with electric current so as to achieve deeper penetration<sup>5</sup> and better results – the phenomenon known as Iontophoresis<sup>6,7,8</sup>. Iontophoresis deposits more of active ions into tooth substance and also the depth of penetration of the active ions is far greater than when topical application is given alone<sup>9</sup>. This might lead to a more lasting and predictable treatment of dentinal hypersensitivity.

In recent past, surgical procedures like coronally displaced flap, has also been employed for the management of gingival recession<sup>10</sup>. It is a plastic and reconstructive surgical approach aimed at the restoration of the lost gingiva. Along with improving functional and hygienic aspects of the teeth and surrounding structures, it is also aimed at the improvement of cosmetic aspect as well<sup>11</sup>.

The purpose of this study was to compare the efficacy of a single iontophoretic application of 1% sodium

fluoride with a combined approach of iontophoresis with 1% sodium fluoride and the coronal repositioning of the flap on the exposed root surfaces of the teeth, in the management of dentinal hypersensitivity.

### MATERIALS AND METHOD

The study was conducted on the patients selected from the Outpatient Department of Punjab Government Dental College and Hospital, Amritsar. A total of twenty patients between 30 to 60 years of age, complaining of hypersensitivity on exposed root surfaces and recession not exceeding 3mm on both sides of the arch were selected. Chronic smokers and alcoholics, subjects taking anti-coagulant therapy and/or anti-inflammatory drugs or using desensitizing pastes or mouthwashes, subjects with chipped or cracked teeth, cervical caries, teeth with metallic restorations, inaccessible involved area, shallow vestibular depth, inadequate zone of attached gingiva and presence of any systemic disorder were not included in this study.

The teeth included in the study were divided into two groups: Group A (Teeth in the right quadrant) which received an iontophoretic application of 1% sodium fluoride solution at 1 mA current for 1 minute and Group B (Teeth in the left quadrant) which received the similar iontophoretic application but combined with a coronally repositioned flap operation.

Each group was further divided into two subgroups depending upon the type of stimuli used to grade the hypersensitivity. Subgroup a included subjects which received air blast stimulus and Subgroup b included subjects which received cold water stimulus.

This way the study was divided into four categories, each category included, one group and one subgroup viz.

- 1) Category I: Group A subgroup a
- 2) Category II: Group A subgroup b
- 3) Category III: Group B subgroup a
- 4) Category IV: Group B subgroup b

### DIAGNOSTIC-CUM-EVALUATION TESTS

The teeth selected were rated for the degree of hypersensitivity according to a numerical verbal rating scale using air blast and cold water tests. In

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both tests, the patient was asked to rate the discomfort according to Verbal rating scale (from 0 to 4) and the same were recorded. The score concludes as 0=no discomfort, 1=mild discomfort, 2=moderate discomfort, 3=severe pain only during application and 4=severe pain persisting after removal of stimulus

### **IONTOPHORETIC UNIT**

An apparatus was designed and fabricated for delivering a measurable amount of direct current for iontophoresis. It consisted of a 9 volt battery that supplied direct current of 9 volts, an ammeter with graduations ranging from 0 to 3 mA at differences of 0.05 mA each, a voltmeter from 0 to 10 volts, a variable resistance, a polarity selection switch, an on/off switch, an inactive electrode and an active electrode having a head of no. 7 camel hair brush for agent's application.

### **1% SODIUM FLUORIDE SOLUTION**

Commercially available sodium fluoride salt was weighed and stored in moisture resistant packings, weighing 100 mg each. At the time of application, fresh solution was prepared by dissolving one package of salt in 10 ml of distilled water.

### **METHOD**

**Group A:** In group A, after phase I therapy, the selected teeth were dried and isolated with cotton rolls. The inactive electrode was held firmly, but lightly in contact with attached gingiva of the tooth receiving the application. The brush of the active electrode of the iontophoretic unit was dipped into 1% freshly prepared sodium fluoride solution, and applied on the exposed surface of the tooth. The current was switched on and the resistance knob was slowly turned clockwise till the reading was 1 mA. The brush was kept at the tooth surface for one minute without any movement so as to avoid its displacement to the adjacent gingiva.

**Group B:** In group B, after local anesthesia administration, the sulcular incision was given and a full thickness periodontal flap was raised. Entire surgical site was thoroughly debrided and irrigated profusely with 1% betadine followed by normal saline solution. After that, a similar iontophoretic application of 1% sodium fluoride as given on the right side (Group A), at the same therapeutic dosage was applied. A semilunar incision was given in the alveolar mucosa of the concerned tooth and flap was repositioned coronally and interrupted sutures with 4-0 black silk thread were placed in each interdental space at the surgical site. Standard post-operative protocol was implemented.

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The purpose of this study was to compare the efficacy of a single iontophoretic application of 1% sodium fluoride with a combined approach of iontophoresis with 1% sodium fluoride and the coronal repositioning of the flap on the exposed root surfaces of the teeth, in the management of dentinal hypersensitivity.

### **MATERIALS AND METHOD**

The study was conducted on the patients selected from the Outpatient Department of Punjab Government Dental College and Hospital, Amritsar. A total of twenty patients between 30 to 60 years of age, complaining of hypersensitivity on exposed root surfaces and recession not exceeding 3mm on both sides of the arch were selected. Chronic smokers and alcoholics, subjects taking anti-coagulant therapy and/or anti-inflammatory drugs or using desensitizing pastes or mouthwashes, subjects with chipped or cracked teeth, cervical caries, teeth with metallic restorations, inaccessible involved area, shallow vestibular depth, inadequate zone of attached gingiva and presence of any systemic disorder were not included in this study.

The teeth included in the study were divided into two groups: Group A (Teeth in the right quadrant) which received an iontophoretic application of 1% sodium fluoride solution at 1 mA current for 1 minute and Group B (Teeth in the left quadrant) which received the similar iontophoretic application but combined with a coronally repositioned flap operation.

Each group was further divided into two subgroups depending upon the type of stimuli used to grade the hypersensitivity. Subgroup a included subjects which received air blast stimulus and Subgroup b included subjects which received cold water stimulus.

This way the study was divided into four categories, each category included, one group and one subgroup viz.

- 1) Category I: Group A subgroup a
- 2) Category II: Group A subgroup b
- 3) Category III: Group B subgroup a
- 4) Category IV: Group B subgroup b

### **DIAGNOSTIC-CUM-EVALUATION TESTS**

The teeth selected were rated for the degree of hypersensitivity according to a numerical verbal rating scale using air blast and cold water tests. In both tests, the patient was asked to rate the discomfort according to Verbal rating scale (from 0 to 4) and the same were recorded. The score concludes as 0=no discomfort, 1=mild discomfort, 2=moderate discomfort, 3=severe pain only during application and 4=severe pain persisting after removal of stimulus

### **IONTOPHORETIC UNIT**

An apparatus was designed and fabricated for delivering a measurable amount of direct current for iontophoresis. It consisted of a 9 volt battery that supplied direct current of 9 volts, an ammeter with graduations ranging from 0 to 3 mA at differences of 0.05 mA each, a voltmeter from 0 to 10 volts, a variable resistance, a polarity selection switch, an on/off switch, an inactive electrode and an active electrode having a head of no. 7 camel hair brush for agent's application.

### **1% SODIUM FLUORIDE SOLUTION**

Commercially available sodium fluoride salt was weighed and stored in moisture resistant packings, weighing 100 mg each. At the time of application, fresh solution was prepared by dissolving one package of salt in 10 ml of distilled water.

### **METHOD**

**Group A:** In group A, after phase I therapy, the selected teeth were dried and isolated with cotton rolls. The inactive electrode was held firmly, but lightly in contact with attached gingiva of the tooth receiving the application. The brush of the active electrode of the iontophoretic unit was dipped into 1% freshly prepared sodium fluoride solution, and applied on the exposed surface of the tooth. The current was switched on and the resistance knob was slowly turned clockwise till the reading was 1 mA. The brush was kept at the tooth surface for one minute without any movement so as to avoid its displacement to the adjacent gingiva.

**Group B:** In group B, after local anesthesia administration, the sulcular incision was given and a full thickness periodontal flap was raised. Entire surgical site was thoroughly debrided and irrigated profusely with 1% betadine followed by normal saline solution. After that, a similar iontophoretic application of 1% sodium fluoride as given on the right side (Group A), at the same therapeutic dosage was applied. A semilunar incision was given in the alveolar mucosa of the concerned tooth and flap was repositioned coronally and interrupted sutures with 4-0 black silk thread were placed in each

interdental space at the surgical site. Standard post-operative protocol was implemented.

### RESULTS

The teeth were subjected to evaluation criteria after one, two, four, eight and twelve week's period of observation. The hypersensitivity was recorded at each recall. Results thus obtained were put to statistical analysis.

Table 1 (graph 1) shows the grand mean reduction in dentinal hypersensitivity in all four categories after 12 weeks of observation against the baseline level (i.e. preoperative mean dentinal hypersensitivity). In category I, the grand mean reduction was 1.30 over an observation period of 12 weeks against the baseline level of 3.00. Similarly, in category II, the grand mean reduction was 1.08 over an observation period of 12 weeks against the baseline level of 2.75. In category III, the grand mean reduction was 1.12 over an observation period of 12 weeks against the baseline level of 3.00. In category IV, the grand mean reduction was 1.08 over an observation period of 12 weeks against the baseline level of 2.75.

**TABLE 1 :**  
Grand Mean Reduction in all categories after 12 weeks of observation against the baseline values

Categories	Pre-operative Rating Of Hypersensitivity	Post-operative Rating Of Hypersensitivity (12 Weeks Of Observation)
I	3.00	1.30
II	2.75	1.08
III	3.00	1.12
IV	2.75	1.08

Table 2 & 3 (graph 2 & 3) shows that there was a significant reduction in dentinal hypersensitivity, irrespective of the stimuli used, by both iontophoretic application alone and similar iontophoretic application combined with coronally repositioned flap.

**TABLE 2 :**

showing comparison of the reduction in mean percentage change in dentinal hypersensitivity at different periods of observation in category I and II

Periods Of Observation	I v/s II	NUMBER OF PATIENTS	MEAN	T - VALUE
After 1 week of observation	CWIT <sub>1</sub> - CWICT <sub>1</sub>	20 20	-30.00 -37.08	0.490
After 2 weeks of observation	CWIT <sub>2</sub> - CWICT <sub>2</sub>	20 20	-48.75 -45.41	0.211
After 4 weeks of observation	CWIT <sub>3</sub> - CWICT <sub>3</sub>	20 20	-70.00 -65.83	-0.344
After 8 weeks of observation	CWIT <sub>4</sub> - CWICT <sub>4</sub>	20 20	-73.33 -71.66	-0.170
After 12 weeks of observation	CWIT <sub>5</sub> - CWICT <sub>5</sub>	20 20	-80.00 -70.83	-0.953

**TABLE 3:**

Showing the comparison of the reduction in mean percentage change in dentinal hypersensitivity at different periods of observation in category II and IV

Periods Of Observation	I v/s II	NUMBER OF PATIENTS	MEAN	T - VALUE
After 1 week of observation	ABIT <sub>1</sub> - ABICT <sub>1</sub>	20 20	-30.83 -27.91	-0.274
After 2 weeks of observation	ABIT <sub>2</sub> - ABICT <sub>2</sub>	20 20	-46.66 -44.16	-0.182
After 4 weeks of observation	ABIT <sub>3</sub> - ABICT <sub>3</sub>	20 20	-62.08 -68.33	0.483
After 8 weeks of observation	ABIT <sub>4</sub> - ABICT <sub>4</sub>	20 20	-68.33 -77.50	0.880
After 12 weeks of observation	ABIT <sub>5</sub> - ABICT <sub>5</sub>	20 20	-73.75 -79.58	0.606

Table 4 & 5 (graph 4 & 5) shows that there was no statistically significant difference in reduction of dentinal hypersensitivity when compared between air blast stimulus and cold water stimulus. No worsening of scores from the baseline was observed at the end of the study.

**TABLE 4:**

Showing the comparison of the reduction in mean percentage change in dentinal hypersensitivity at different periods of observation in category I and II

Periods Of Observation	I v/s II	NUMBER OF PATIENTS	MEAN	T - VALUE
After 1 week of observation	ABIT <sub>1</sub> - CWIT <sub>1</sub>	20 20	-30.83 -30.00	-0.067
After 2 weeks of observation	ABIT <sub>2</sub> - CWIT <sub>2</sub>	20 20	-46.66 -48.75	0.156
After 4 weeks of observation	ABIT <sub>3</sub> - CWIT <sub>3</sub>	20 20	-62.08 -70.00	0.605
After 8 weeks of observation	ABIT <sub>4</sub> - CWIT <sub>4</sub>	20 20	-68.33 -73.33	0.485
After 12 weeks of observation	ABIT <sub>5</sub> - CWIT <sub>5</sub>	20 20	-73.75 -80.00	0.682

**TABLE 5:**

showing the comparison of the reduction in mean percentage change in dentinal hypersensitivity at different periods of observation in category III and IV

The results further indicated that the improvement in dentinal

Periods Of Observation	I v/s II	NUMBER OF PATIENTS	MEAN	T - VALUE
After 1 week of observation	ABICT <sub>1</sub> - CWIT <sub>1</sub>	20 20	-27.91 -37.08	0.709
After 2 weeks of observation	ABICT <sub>2</sub> - CWIT <sub>2</sub>	20 20	-44.16 -45.41	0.077
After 4 weeks of observation	ABICT <sub>3</sub> - CWIT <sub>3</sub>	20 20	-68.33 -65.83	-0.209
After 8 weeks of observation	ABICT <sub>4</sub> - CWIT <sub>4</sub>	20 20	-77.50 -71.66	-0.589
After 12 weeks of observation	ABICT <sub>5</sub> - CWIT <sub>5</sub>	20 20	-79.58 -70.83	-0.870

hypersensitivity was statistically insignificant comparing two modes of stimuli i.e. air blast and cold water stimuli in both the groups. However, the improvement was statistically significant in group A and in group B i.e. subjects when treated with iontophoretic

application alone and a similar application combined with coronally repositioned flap for both the stimuli.

## DISCUSSION

The menace of dentinal hypersensitivity is one of the most common ailments confronted in routine by the dentists. Over the years, a wide variety of materials and methods<sup>4</sup> have been tried for the treatment of dentinal hypersensitivity. Various agents have been used for the treatment of dentinal hypersensitivity with varying results. These agents include sodium fluoride<sup>12</sup>, stannous fluoride<sup>12</sup>, sodium monofluorophosphate<sup>13</sup>, strontium chloride<sup>6</sup>, sodium citrate<sup>14</sup>, potassium oxalate<sup>15</sup>, resins/adhesives<sup>15</sup> etc. These agents have been utilized for topical application<sup>8</sup> either as a home<sup>16</sup> care measure or as an office procedure<sup>17</sup>.

Iontophoresis is one such procedure whereby the desensitizing agents are penetrated deep<sup>5</sup> into the open dentinal tubules with the help of electric current. Recently, various periodontal surgical procedures are also being tried<sup>18</sup> to cover the denuded root surface so as to alleviate the problem of dentinal hypersensitivity. Tarnow's technique of covering of exposed root surfaces using a semilunar flap was described as a definitive treatment by Thompson<sup>19</sup> for eliminating the dentinal hypersensitivity.

The present study was carried out to evaluate and compare the effect of iontophoretic application of 1 % sodium fluoride solution at 1 mA current for 1 minute on one side to the effect of a similar iontophoretic application combined with coronally repositioned flap on the other side in the management of dentinal hypersensitivity on exposed root surfaces.

Two stimuli in the form of air blast and cold water were used in the study to diagnose and evaluate the grade of dentinal hypersensitivity. Various techniques and methods have been tried in the past, but these two methods are easy to manipulate and are well accepted. (Gillam and Newman 1993)<sup>20</sup>.

The findings of the present study in group A (category I & II), showed marked improvement in almost 100% of the treated teeth. Patients remarked a significant reduction in dentinal hypersensitivity with sodium fluoride iontophoresis. These findings are in concurrence with findings of Jensen (1964)<sup>7</sup>, Murthy et al (1973)<sup>21</sup>, Carlo (1982)<sup>22</sup>, Lutins et al (1984)<sup>23</sup>, Kern (1989)<sup>8</sup>, Mc Bride et al (1991)<sup>24</sup>, who have also reported a variable but significant reduction in dentinal hypersensitivity with the use of fluoride iontophoresis. The findings of the study further indicated that the dentinal hypersensitivity decreased substantially with both the techniques employed i.e. iontophoresis with 1% sodium fluoride solution alone and a similar application combined with coronally repositioned flap procedure. However, when group A and B were compared, the decrease in dentinal hypersensitivity was not statistically significant after 12 weeks of observation showing thereby the iontophoretic application of 1 % sodium fluoride alone remarkably reduced the dentinal hypersensitivity. However the procedure when used in combination with coronally repositioned flap gave the additional benefit of a better esthetic appearance by covering the denuded root surfaces. Further, iontophoretic application of 1 % sodium fluoride at 1 mA current for 1 minute was considered safe since no untoward reaction was seen during the course of study. These findings are in concurrence with the findings of earlier studies viz Sausen (1955)<sup>25</sup>, Collins (1962)<sup>26</sup>, Scott (1962)<sup>27</sup> and Lefkowitz (1962)<sup>28</sup> who have shown the current upto 1 mA was safe to use as it had no adverse effect on pulpal tissue. No worsening of scores was observed at the end of the study.

The results further indicated that the improvement in dentinal hypersensitivity was statistically insignificant comparing two modes of stimuli i.e. air blast and cold water stimuli in both the groups.

However, the improvement was statistically significant in group A and in group B i.e. subjects when treated with iontophoretic application of 1 % sodium fluoride solution alone and a similar application combined with coronally repositioned flap for both the stimuli.

One striking finding during study was that in all the four categories, a few patients showed an increased rating of hypersensitivity after being subjected to both the treatment modalities during the course of study. The fluctuation observed might be attributed to the lack in following the plaque control instructions, improper and forceful tooth brushing, intake of acidic food substances and psychological factors altering the pain reaction as reported in earlier studies by Addy, Absi and Adams (1987)<sup>29</sup> and Curro (1990)<sup>2</sup>. The patients were motivated again to follow the proper oral hygiene measures and the treatment regimen meticulously.

Within all the four categories, it was found that there was a gradual increase in the percentage of teeth showing good relief over the passage of time and at 12 weeks of observation period, the sensitivity was decreased significantly as compared to the baseline scores. It might be attributed to the natural desensitization of dentin, iontophoretic application of sodium fluoride and coverage of denuded root surfaces by the coronal positioning of flap contributing to the reduction in dentinal hypersensitivity.

Several explanations are quoted in the literature for the natural desensitization of the denuded root surfaces. As saliva is saturated in calcium and phosphate with respect to most forms of insoluble calcium phosphate at normal salivary flow rates and pH, there are numerous physiochemical mechanisms tending to occlude dentinal tubules with a variety of crystal types. The transudation of plasma and the macromolecules that it contains may tend to fill the tissue spaces and perhaps the pulpal ends of tubules with fibrin, thereby decreasing the size of diffusion channels and decreasing dentinal permeability.

Although the exact mechanism by which fluoride iontophoresis produces desensitization is not known, several hypothesis have been proposed. One mechanism proposed<sup>28</sup> involves the formation of reparative dentin following application of current to dentin which results in formation of dead tracts in the primary dentin. Another explanation of iontophoresis is that the electric current produces paraesthesia by altering the sensory mechanisms of pain conduction. A third alternative explanation is that the concentration of fluoride ions in dentinal tubules may be increased due to fluoride iontophoresis which could cause microprecipitation of calcium fluoride that may block hydrodynamically mediated pain inducing stimuli<sup>30</sup>. Another possible explanation is that fluoride ion has been demonstrated to be a potent inhibitor of many enzymes. It may be that intracellular changes in sensory nerves or other cells are responsible for interference of nerve conduction<sup>31</sup>.

The coronal positioning of the gingival tissue to correct root sensitivity is explained on the basis that the gingival tissues covering the denuded root surfaces tend to isolate the exposed dentin from the oral fluids and thermally insulate the area. The granulation tissue that fills the semilunar area turns into the same type of tissue that was present before repositioning of the tissue and usually of the similar color. This surgery also enhances gingival esthetics<sup>19</sup>.

## CONCLUSION

The present study recommends the use of iontophoresis alongwith repositioning of flap to alleviate the menace of dentinal hypersensitivity and also to improve the esthetics of the patients. However, before some definitive conclusion can be drawn, further studies are warranted on larger number of samples using objective criteria of evaluation.

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## TABLES

The abbreviations used in tables and graphs are:

AB	=	Air-blast stimulus
CW	=	Cold water stimulus
I	=	Iontophoretic application of 1 % sodium fluoride solution at 1 mA current for one minute
IC	=	Iontophoretic application of 1 % sodium fluoride solution at 1 mA current for one minute combined with coronally repositioned flap procedure
T0	=	Observation at preoperative level
T1	=	Observation at 1 week of time interval
T2	=	Observation at 2 weeks of time interval
T3	=	Observation at 4 weeks of time interval
T4	=	Observation at 8 weeks of time interval
T5	=	Observation at 12 weeks of time interval

## BIBLIOGRAPHY

- Gorman WJ. Prevalence and etiology of gingival recession. *J Periodontol* 1967;38:316.
- Curro FA, Ed. Tooth hypersensitivity. *Dent Clin North America* 1990;34(3):403-587.
- Reinhart TC, Killoy WJ, Love J, Overman PR, Sakumara JS. The effectiveness of a patient applied tooth desensitizing gel: A pilot study. *J Clin Periodontol* 1990;17:123-127.
- Berman LH. Dentinal sensation and hypersensitivity: A review of mechanisms and treatment alternatives. *J Periodontol* 1984;56(4):216-222.
- Wilson JM, Fry BW, Walton RE, Gangarosa LP. Fluoride levels in dentin after iontophoresis of 2 % sodium fluoride. *J Dent Res* 1984;63(6):897-900
- Gupta RR. To compare the effect of the strength of electrical; current in the management of dentinal hypersensitivity with iontophoretic unit using 10 % strontium chloride, MDS thesis, Pbi Univ, Patiala, 1994.
- Jenson AL. Hypersensitivity controlled by iontophoresis – Double blind clinical investigation. *J Am Dent Assoc* 1964;68:216-224.
- Kern DA, McQuade MJ, Scheidt MJ, Hansen B, Van Dyke TE. Effectiveness of sodium fluoride on tooth hypersensitivity with or without iontophoresis. *J Periodontol* 1989;60:386-389.
- Barbakow F. Investigations of the effect of iontophoresis on the surface fluoride content in enamel. *J Dent Res* 1972;51:845.
- Sumner CF. Surgical repair of recession on the maxillary cuspid : Incisally positioning the gingival tissue. *J Periodontol* 1969;55:119-121.
- Restrepo OJ. Coronally repositioned flap : Report of four cases. *J Periodontol* 1973;44(9):564-568.
- Addy M, Mostafa P. Dentin hypersensitivity – Part II. Effects produced by the uptake invitro of tooth pastes on to dentin. *J Oral Rehab* 1989;16:35-48.
- Bansal M. Comparison of efficacy of 1 % solution of sodium fluoride, freshly prepared and commercially available (Flucol Solute) in the management of dentin hypersensitivity, MDS Thesis, Pbi Univ, 1999.
- Tarbet WJ, Silverman G, Fratarcangelo PA, Kanapka JA. Home treatment for dentinal hypersensitivity – A comparative study. *J Am Dent Assoc* 1982;105:227-230
- Johnson RH, Zulqar Nain BJ, Koval JJ. The effectiveness of an electroionizing tooth brush in the control of dentinal hypersensitivity. *J Periodontol* 1982;53:353-359.
- Wycoff SJ. Current treatment for dentinal hypersensitivity, *Comp Cont Educ Com Dent* (suppl. 3), 1982. Quoted by Reinhart TC et al. The effectiveness of a patient applied tooth desensitizing gel. *J Clin Periodontol* 1990;7:123-127.
- Welch EH, Eick JD. A method to reduce or prevent post operative sensitivity with posterior composite resin restorations. *Quintess Int* 1986;7:667-676.
- Prato GP et al. Guided tissue regeneration versus mucogingival surgery in the treatment of human buccal gingival recession. *J Periodontol* 1992;63:919-927.
- Thompson BK, Meyer R, Singh GB, Mitchel W. Desensitization of exposed root surfaces using a semilunar coronally repositioned flap. *Gen Dent* 2000;68-71.
- Gillam DG, Newman HN. Assessment of pain in cervical dentinal sensitivity studies : A review. *J Clin Periodontol* 1993;20:383-394.
- Murthy KS, Salim ST, Singh I. A comparative evaluation of topical application and iontophoresis of sodium fluoride for desensitization of hypersensitive dentin. *J Oral Surg* 1973;36:448-458.
- Carlo GT, Ciancio SG, Seyrek SK. An evaluation of iontophoretic application of fluoride for tooth desensitization. *J Am Dent Assoc* 1982;105:452-454.
- Lutins ND, Grecot GW, McFall WT. Effectiveness of sodium fluoride on tooth hypersensitivity with or without iontophoresis. *J Periodontol* 1984;55:285-288.
- McBride MA, Gilpatrick RO, Fowier WI. The effectiveness of sodium fluoride iontophoresis in patients with sensitive teeth. *Quintess Int* 1991;22:637-640.
- Sausen R. Electrophoresis in dentine with radioactive calcium. *J Dent Res* 1955;34:12.
- Collins EM. Desensitization of hypersensitive teeth. *Dent Digest* 1962;360-363.
- Scott HM. Reduction of sensitivity by electrophoresis. *J Dent Child Fourth Quarter*, 1961;225-241.
- Lefkowitz W. Pulp response to ionization. *J Prosthet Dent* 1962;12(5):966-976.
- Addy M, Absi EG, Adams D. Dentin hypersensitivity – The effects in vitro of acids and dietary substances on root planed and burred dentin. *J Clin Periodontol* 1987;14:274-279.
- Gangarosa LP (Sr), Park NH. Practical considerations in iontophoresis of fluoride for desensitizing dentin. *J Prosthet Dent* 1978;39:173.
- Walton RE, Leonard LA, Sharawy M, Gangarosa LP, Augusta GP. Effects on pulp and dentin of iontophoresis of sodium fluoride on exposed roots in dogs. *J Oral Surg* 1977;48:545-556.

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## In vivo effectiveness of Laser Fluorescence compared to Visual Inspection and Intraoral Camera for detection of Occlusal caries.

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### Abstract

**Objective :** The aim of this study was to compare, and evaluate the efficacy of different diagnostic aids for diagnosis of occlusal caries.

**Material & methods:** Occlusal surfaces of 100 primary and permanent molars were examined using the four diagnostic systems (visual, intraoral camera, DIAGNOdent). These results were compared with operative intervention gold standard. Sensitivity was calculated for each diagnostic system for both enamel and dentine caries. Inter rater agreement were calculated for each diagnostic system using kappa statistics.

**Main outcome measures:** Sensitivity and Inter rater agreement kappa for each diagnostic system.

**Results:** For both enamel and dentine caries the highest sensitivity values were provided by DIAGNOdent (0.91 & 0.72). The DIAGNOdent gave the highest value of kappa for inter-rater agreement i.e. 0.816. While intercomparing kappa value between three diagnostic test it was found that the value of kappa is highest between DIAGNOdent and intraoral camera (dry) i.e. 0.667.

**Conclusion:** It was concluded that DIAGNOdent could be used as an effective and reliable tool in the detection of occlusal caries in deciduous teeth and its good reproducibility should enable the laser device to monitor the caries process over time.

### Key words

Occlusal Lesion. DIAGNOdent. Visual Inspection. Intraoral Camera

### INTRODUCTION

Caries, because of its uniqueness as a disease, its ubiquitous nature, and its stubborn resistance to resolution remains as one of man's most common, oldest, and singly costliest ailment. The total health handicap due to dental caries is staggering and has become a dichotomous disease especially in children. With an age of specialization and compartmentalization of knowledge there has been a decline in prevalence of caries but it still remains a vestigial remnant of bygone time. The reduction in caries prevalence has not occurred uniformly for all dental surfaces. With the advancement in oral hygiene awareness and preventive measures there is decline in prevalence of smooth surface caries. But despite of increased understanding of disease process & the availability of effective intervention, many lesions involving occlusal fissures, still progress to the stage where tooth surface is compromised and invasive intervention and restoration are required because of complex invaginated anatomy and minute dimensions of fissures. [Rohr et al., 1991; Wang et al., 1994; Hannigan et al., 2000] Accurate and reliable diagnosis of non-cavitated occlusal caries is important because these lesions can be arrested at an early stage by preventive measures and if not diagnosed can lead to unnecessary loss of tooth structure. For several decades the accepted

method for detection of caries had been visual examination. "Seeing is believing" was the approach adopted by Europeans as diagnostic aid which was modified by C.F. MAURY in 19th century with invention of mouth mirror.<sup>3</sup> This combination of visual examination and probing were the mainstay of occlusal caries diagnosis for years because it is acquired easily, requires no special maintenance other than sharpening & does not require additional training, extra time, and special sterilization procedures. Fraction<sup>4</sup>. That is why visual examination has been used as a diagnostic method in this study. Unfortunately vision alone as a diagnostic tool may leave much to be desired. This realization, coupled with the observation that the use of the dental explorer in the historical manner resulted in an unacceptably high proportion of false-positive diagnoses on occlusal surfaces, and transfer of cariogenic micro-organisms from one site to another [Loesche et al., 1979]<sup>5</sup> indicate that use of visual examination was of limited value for the detection of occlusal caries. Therefore, to complement traditional visual examination use of aided visual examination i.e. with intraoral camera for diagnosis of caries is done in this study, to enhance the reproducibility and efficacy of visual examination. Intraoral camera is a feasible alternative to a visual oral examination for caries screening as it gives a magnified view (x10) and large range of viewing angles. [Ekstrand et al.,

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But these do not enhance detection of initial occlusal caries lesions in enamel of either permanent or deciduous teeth [Flaitz et al., 1986; Nyttun et al., 1992; Ketley and Holt, 1993]. 7,8

Tools based on fluorescence were introduced to overcome this problem. Laser fluorescence (LF) seems to be promising for the detection and quantification of caries lesions on occlusal surface [Hibst and Gall, 1998; Shi et al., 2000; Sheehy et al., 2001]9. Carious lesion scatters the reflected light more than that of sound enamel. (Angmar –Mansson and Ten Bosch, 1987, Backer-Dirks,1966; Neilson and Pitts,1991; Angmar –Mansson et al ,1996)10 Based on this Hibst and Gall (1998) found that red light induced fluorescence (655nm) could reveal considerable contrast between sound and carious tooth tissue and introduced DIAGNOdent (Hibst et al 2001) 11. Fluorescence was found to be more intense in carious tissue (140 relative fluorescence intensity) as compared with sound tissue (20 relative fluorescence intensity). Hence, due to its good reproducibility and validity DIAGNOdent has been proved as a valuable adjunct in early detection of caries. Therefore, in the present study DIAGNOdent is used for early detection and quantification of occlusal caries.

The importance of early detection of caries activity is emphasized by the fact that an incipient carious lesion which are amenable to remineralization can be arrested, reversed or restored with minimal invasion13 Therefore, the aim of this study was to assess the validity and reproducibility of three different methods (visual examination, visual examination with intraoral camera, DIAGNOdent) for early detection of occlusal carious lesions

## MATERIALS AND METHODS

### Subject Selection

The sample consisted of 48 children ranging between 5-14 years of age with enamel and / or dentine caries The Ethics Committee in D.J.College of Dental Sciences & Research, Modinagar approved the study before the start. Consent was taken from the patients. Inclusion criteria for teeth in this study were the apparent absence of occlusal restorations and fissure sealants, absence of hypoplastic pits, advanced degree of fluorosis, frank occlusal cavitation and large carious lesions on smooth and approximal surfaces.

A total of 100 sites were selected from 48 children which comprise 36 1st deciduous molar, 30 2nd deciduous molar & 34 permanent first molar.(flowchart1). After oral prophylaxis careful cleaning of the occlusal surfaces with rotating bristle brush and water, was done.

## EXAMINATION METHODS:

### Sterilization of instruments

Instruments used in the study were autoclaved for 45 minutes in hot air autoclave or cold sterilization accordingly.

### Visual examination

Visual inspection was performed with patients positioned in a dental chair, with the aid of a light reflector, air/water spray and plane buccal mirror using the criteria shown in table 1 [Ekstrand et al., 1997]. Visual examination was done both on wet surface and after drying with compressed air and isolation with sterilized cotton rolls. This was done because transition from sound enamel (enamel translucency) to opacity which is visible after or without air-drying is an indicator of caries initiation , and transition from opacity visible after air-drying to opacity without air-drying is an indication of caries progression (Thylstrup and co-workers,1996).

## INTRAORAL CAMERA

Diagnosis with intraoral camera (Miura) was also done both on wet surface and after isolation with sterilized cotton rolls. The carious lesion was examined under standard dental operating light with mouth mirror and intraoral camera using television, which shows the magnified images (10X) of the tooth examined with intraoral camera. They were scored using the criteria shown in table 1. Intraoral camera act as an enhancement aid to improve the reproducibility of visual examination

## DIAGNODENT

The DIAGNOdent (KAVO, Birbeck Germany) measurements were conducted in accordance with the operating manual after drying the tooth for 10 second. Prior to use the instrument was calibrated in accordance with the manufacturer's instructions and recalibrated for each examination session of approximately 25 teeth. The angle of the tip was rotated and scanned over the area of interest on the tooth surface to record the peak value which could range from 0 (sound) to 99 (caries). The readings of peak value were then recorded according to the criteria given by Lussi et al (1999) (Table 2).

## OPERATIVE INTERVENTION

### (Pit and fissure opening)

Operative intervention was done after interpretation of values of all three diagnostic methods.. Out of 100 teeth examined, 8 teeth had a visual score 0 and 1 (Ekstrand criteria) and DIAGNOdent value less than 15(Lussi criteria) thus indicating that no caries was present. Thus, out of 100 teeth 92 occlusal carious molars were opened with a airrotor handpiece. Penetration depth of carious lesion was estimated visually using WHO periodontal probe. The greatest extent of caries was classified according to the following score given by Ekstrand et al, 2001(Table No. 3). The restoration of carious teeth was done according to carious lesion In the teeth having caries up to outer 1/3rd of enamel enameloplasty was done. All teeth having depth greater than 1/3rd of enamel were restored with glass ionomer cement (N100 3MESPE)

## STATISTICAL ANALYSES

The data was statistically analyzed to test the validity separately for lesion in enamel and dentine in terms of sensitivity (proportion of carious lesion identified correctly).The inter-rater agreement (Kappa) was observed for all four modalities to evaluate agreement of diagnostic modalities with respect to operative intervention.and Inter-comparison between all four diagnostic methods were done by using kappa statistics.

## RESULTS :

After operative intervention was used as a gold standard it was found that out of 100 teeth, 8 had no caries ( score 0), 20 teeth had enamel caries ( score 2), 72 had caries extending up to dentine (score 2) according to Ekstrand criteria

While observing visual examination on wet surface with respect to operative intervention out of 100 cases visual examination (wet) correlated 100% score 0, while it correlated only 44.4% with score 1 i.e. it gave 28 true positive results and 27 true negative results. The correlation between visual examination and operative intervention score 2 is only 5.4% i.e. it gave only 2 true positive result and 35 true negative results. (Graph 1)

While comparing visual examination on dry surface with respect to operative intervention out of 100 cases visual examination (dry) correlated 100% with score 0, while it correlated only 48.4% with score 1 The correlation between visual examination and operative intervention score 2 is only 8.4% (Graph 1)

While observing intraoral camera on wet surface with respect to operative intervention out of 100 cases intraoral camera (wet) correlated 25% with score 0 i.e. gave 2 true positive results and 6 false positive results, while it correlated 82.8% with score 1 i.e. it gave 48 true positive results and 7 false positive results. The correlation between intraoral camera and operative intervention score 2 is 100% i.e. it gave 37 true positive results. (Graph 2)

While comparing intraoral camera and operative intervention on dry surface out of 100 cases intraoral camera (dry) correlated 40% with operative intervention score 0 while it correlated 84.8% with score 1 and for score 2 is 100% i.e. it gave 37 true positive results. (Graph 2)

While observing DIAGNOdent with respect to operative intervention out of 100 cases DIAGNOdent correlated 100% with operative intervention score 0 i.e. gave 8 true positive results, while it correlated 80.8% with score 1 i.e. it gave 44 true positive results, 8 true negative results and 3 false positive results. The correlation between DIAGNOdent and operative intervention score 2 is 100% i.e. it gave 37 true positive results. (Graph 3)

For enamel caries the sensitivity was found to be highest for DIAGNOdent i.e. 0.91 & lowest for visual examination (wet) i.e. 0.6087. For dentine caries the sensitivity was found to be highest for DIAGNOdent i.e. 0.72 & lowest for visual examination i.e. 0.50

Thus, it was observed that out of the four methods, DIAGNOdent is more sensitive in detecting enamel and dentine caries.

The inter-rater agreement (Kappa) was observed for all three modalities to evaluate agreement of diagnostic. While observing measurement of kappa for all four test the value of kappa is highest for DIAGNOdent i.e. 0.816 which signifies almost perfect agreement with operative intervention according to Landis and Koch interpretation results (1977) and is lowest for visual examination (wet) i.e. 0.03 which denotes slight agreement with operative intervention (graph 4). Thus, the results reveal that DIAGNOdent is a better diagnostic modality than other modalities used in the present study with respect to operative intervention.

#### INTERCOMPARISON BETWEEN METHODS.

While intercomparing kappa value between diagnostic test it was found that the value of kappa is highest between DIAGNOdent and intraoral camera (dry) i.e. 0.667 which signifies substantial agreement between DIAGNOdent and intraoral camera (dry) and is lowest between visual examination (wet) and intraoral camera i.e. 0 which signifies no agreement between visual examination (wet) and intraoral camera according to Landis & Koch criteria. (Table 5)

#### DISCUSSION .

For both clinical and epidemiological studies, it is a fundamental premise that diagnostic methods exist which may provide consistent and standardized expressions of the condition in question. This premise places emphasis on the issue of reproducibility and validity of the diagnostic methods available [Nyvad et al., 1999]. The present investigation has demonstrated that the DIAGNOdent device is capable of obtaining high sensitivity on the occlusal sites of deciduous teeth with macroscopically intact surfaces. The performance was similar to that found in a recently published in vitro study in deciduous teeth [Attrill and Ashley, 2001] as well as in in vitro and in vivo studies in permanent teeth [Lussi et al., 1999, 2001; Shi et al., 2000].

An ideal diagnostic method should offer, among other characteristics, high sensitivity. Normally, a very high specificity is obtained at the expense of reduced sensitivity. Likewise, an increase in sensitivity will be accompanied by a decrease in specificity (increase in the false-positive diagnosis). Considering that a rise in the false-positive proportion can be dangerous as it can lead to overtreatment, a technique that offers high specificity even at the expense of a slight reduction in sensitivity seems to be more appropriate [Downer, 1989]. In this study, for all diagnostic methods higher values sensitivity was found to be for DIAGNOdent i.e. 0.91 & lowest for visual examination (wet) i.e. 0.6087. A possible explanation for less efficacy and validity of visual examination in the present study can be attributed to the fact dental caries is a dynamic process, in which early lesion may undergo demineralization before being expressed clinically, thus missed visually.

Among the examination methods used in this study, the DIAGNOdent device was found to have the highest sensitivity for lesions into enamel and dentin. DIAGNOdent seems to be promising for the detection and quantification of caries lesions on occlusal [Hibst and Gall, 1998; Shi et al., 2000; Sheehy et al., 2001]. In 1998, a laser-based diagnostic system was developed using a diode laser as light source and a photodiode combined with a long-pass filter as detector [Hibst, 1999]. The teeth are illuminated by laser light ( $\lambda = 655 \text{ nm}$ ), which is absorbed by the tooth substance. Some of this light is reemitted as near-infrared fluorescent light, and changes in the tooth substance that are associated with progression of the caries process are reflected in an increase in the amount of fluorescent light [Angmar-Månsson and ten Bosch, 1987].

When evaluating a diagnostic method it is very important to test whether it provides a reliable and minimal diagnostic variability between measurements to assure consistency and reproducibility along time. While observing measurement of kappa for all three test the value of kappa is highest for DIAGNOdent i.e. 0.816 which signifies almost perfect agreement with operative intervention according to Landis and Koch interpretation results (1977) and is lowest for visual examination (wet) i.e. 0.03 which denotes slight agreement with operative intervention. Thus, the results reveal that DIAGNOdent is a better diagnostic modality than other modalities used in the present study. This should allow the device to be used for longitudinal monitoring of caries and thus, also, for assessing the outcome of preventive interventions.

In conclusion, this study clearly demonstrated that DIAGNOdent was the most accurate and valid system tested for the detection of occlusal caries. It has the advantage of quantifying the mineral content, helping to improve the diagnostic efficacy and treatment and accurate assessment of fissures where the visual examination alone is not adequate, thus complementing the traditional dental examination. Hence, DIAGNOdent being a modern, noninvasive, sensitive and easier method is an improvement on the currently available methods for detection of initial caries.

#### LEGENDS

- Table 1 . Criteria used in visual examination (Ekstrand et al, 1998)
- Table 2 . Criteria used in examination with DIAGNOdent (Lussi et al, 1999)
- Table 3 . Criteria used in examination after Pit & Fissure opening ( Ekstrand et al, 2001)
- Table 4 : Sensitivity and Specificity of each diagnostic method for Enamel and Dentine caries.
- Table 5 : Inter-comparison values of kappa statistics of four diagnostic test

**Table 1 . Criteria used in visual examination (Ekstrand et al, 1998)**

Score	Criteria
V0	No or slight change in enamel translucency after prolonged air drying ( ≥ 5s)
V1	Opacity hardly visible on the wet surface, but distinctly visible after drying.
V2	Opacity distinctly visible without air drying
V3	Localised enamel breakdown in opaque or discoloured enamel and/or grey discoloration from the underlying dentine.
V4	Cavitation in opaque or discoloured enamel exposing the dentine

**Table 2 . Criteria used in examination with DIAGNOdent (Lussi et al, 1999)**

Score	Criteria
0-14	No caries
15-20	Enamel caries
21-99	Dentinal caries .

**Table 3 . Criteria used in examination after Pit & Fissure opening (Ekstrand et al, 2001)**

Score	Criteria
0-14	No caries
15-20	Enamel caries
21-99	Dentinal caries .

Diagnostic method0	Enamel Caries	Enamel Caries
Visual examination	<b>Sensitivity</b>	<b>Sensitivity</b>
Wet	0.60	0.50
Dry	0.65	0.57
Intraoral camera		
Wet	0.75	0.63
Dry	0.81	0.66
DIAGNOdent	0.91	0.72
DIAGNOdent with dye	0.71	0.61

**Table 4 : Sensitivity of each diagnostic method for Enamel and Dentine caries.**

Diagnostic Test	Measure of Agreement Kappa
VE : VEd	0.472
VE : IC	-0.146
VE : DIAG	0.135
VEd : IC	-0.165
VE d: DIAG	0.154
IC : ICd	0.623
IC : DIAG	0.553
ICd : DIAG	0.667

**Table 5 : Inter-comparison values of kappa statistics of four diagnostic test**

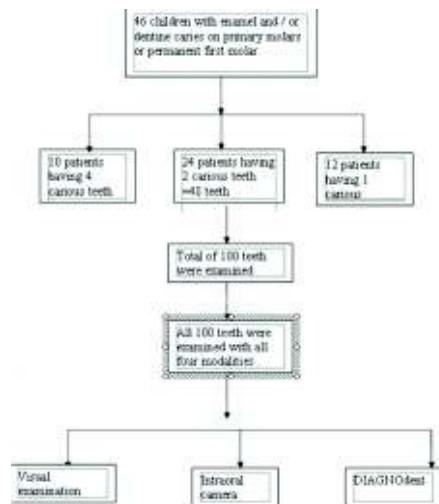
VE: Visual Examination (wet)  
 VEd: Visual Examination (dry)  
 IC: Intraoral Camera (wet)  
 ICd: Intraoral Camera (dry)  
 DIAG: DIAGNOdent

**Illustrations:**

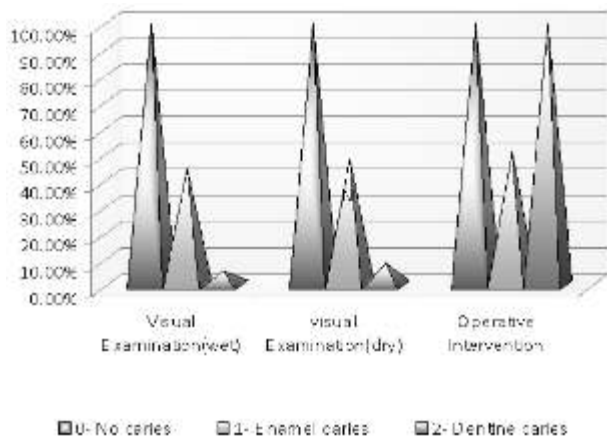
Flowchart 1: Division of Sample  
 Graph 1 : The comparison Visual Examination and Operative Intervention.  
 Graph 2 : The comparison Intraoral camera and Operative Intervention  
 Graph 3 :The comparison DIAGNOdent and Operative Intervention

**Graph 4 : The comparison of kappa of all test**

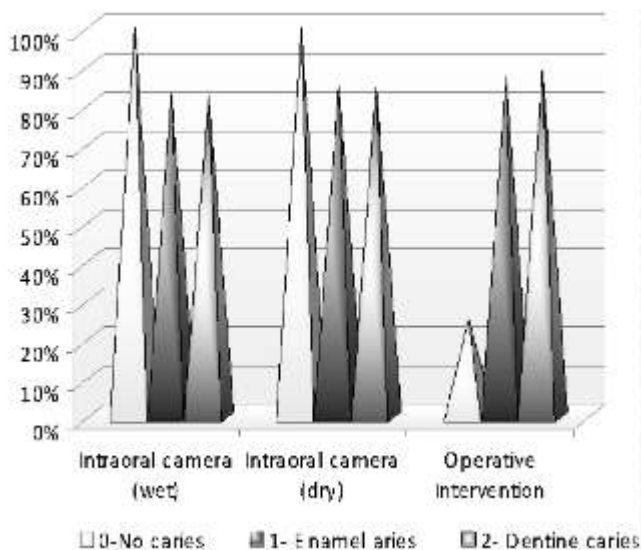




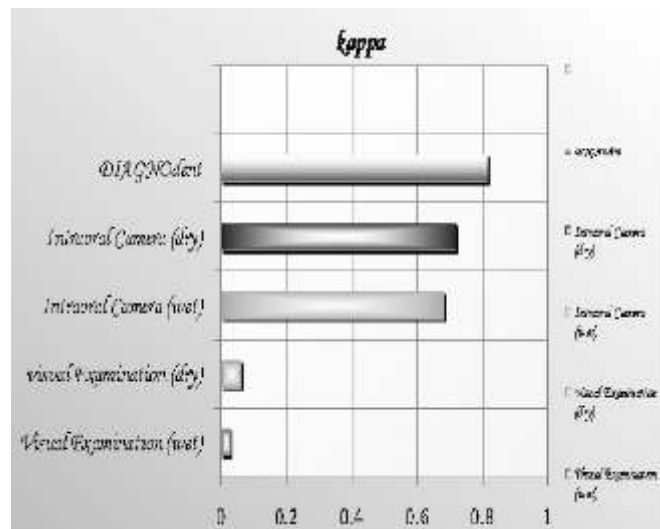
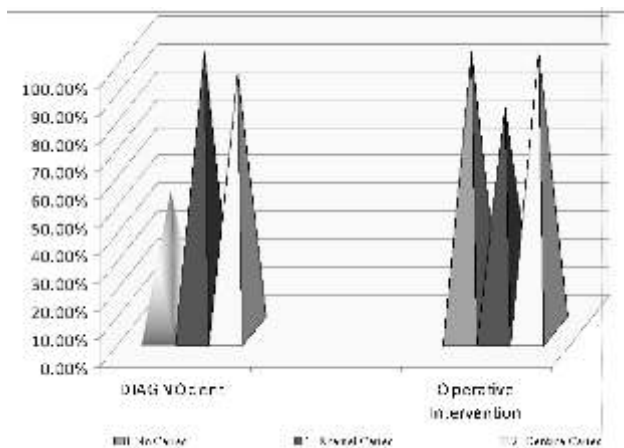
Graph 1 : The comparison Visual Examination and Operative Intervention.



GRAPH 2  
GRAPH 3



GRAPH 4



REFERENCES:

1. Fanerjee A, Watson TF, Kidd EAM. Dentine caries excavation: a review of current clinical techniques. British Dental Journal 2000; 188: 476-482.
2. Willershhausen B, Azrak B, Wilms S. Fear of dental treatment and its possible effects on oral health. European Journal of Medical Research 1999; 4:72-77.
3. Habib CM, Kronman J, Goldman M. A chemical evaluation of collagen and hydroxyproline after treatment with GK-101 (N-chloroglycine). Pharmacology and Therapeutics in Dentistry 1975; 2:209-215.
4. Goldman M, Kronam JH. A preliminary report on a chemomechanical means of caries removal. J Am Dent Assoc 1976; 93(6):1149-53.
5. Schutzbank SG, Galaini J, Kronman JH, Goldman M, Clarke REA. A comparative in vitro study of the effect of GK-101 and GK-101E in caries removal. Journal of Dental Research 1978; 57: 861-864.
6. Beeley JA, Yip HK, Stevenson AG. Chemomechanical caries removal: a review of techniques and latest developments. British Dental Journal 2000; 188: 427-430.
7. A. Lussi, S. Imwinkelried, N.B. Pitts, C. Longbottom, E. Reich. Performance and Reproducibility of a Laser Fluorescence System for Detection of Occlusal Caries in vitro. Caries Res 1999;33:261-

- 266.
8. H. Eggertsson, M. Analoui, M.H. van der Veen, C. González-Cabezas, G.J. Eckert, G.K. Stookey. Detection of Early Interproximal Caries in vitro Using Laser Fluorescence, Dye-Enhanced Laser Fluorescence and Direct Visual Examination. *Caries Res* 1999; 33: 227-233.
  9. Magorzata Tomasik et al. Comparison of visual and laser examination of first permanent molars in patients aged 6-7 years. *Durham Anthropology Journal* 1999; 12:2-3.
  - 10X.-Q. Shi, U. Welander, B. Angmar-Mansson. Occlusal Caries Detection with KaVo DIAGNOdent and Radiography: An in vitro Comparison. *Caries Res* 2000; 34: 151-158
  - 11 Attrill D, PF Ashley. Occlusal caries detection in primary teeth: a comparison of DIAGNOdent with conventional methods. *British Dental Journal* 2001; 190(8) : 440-443
  - 12Sheehy EC, Brailsford SR, Kidd EA, Beighton D, Zoitopoulos L: Comparison between visual examination and a laser fluorescence system for in vivo diagnosis of occlusal caries. *Caries Res.* 2001; 35(6): 421-6.
  - 13Lussi A, Megert B, Longbottom C, Reich E, Francescut P. Clinical performance of a laser fluorescence device for detection of occlusal caries lesions. *European Journal of Oral Sciences.* 2001 Feb; 109(1):14-19.
  - 14Azza A. El-Housseiny, Hana Jamjoum. Evaluation of visual, explorer, and a laser device for detection of early occlusal caries. *Journal of Clinical Pediatric Dentistry.*2001; 6(1): 41-48.
  - 15Raimund Hibst, Robert Paulus, Adrian Lussi. Detection of Occlusal Caries by Laser Fluorescence: Basic and Clinical Investigations. *Medical Laser Application.* 2001; 16(3): 205-213.
  - 16Alwas-Danowska HM, Plasschaert AJ, Suliborski S, Verdonshot EH. Reliability and validity issues of laser fluorescence measurements in occlusal caries diagnosis. *Journal of Dentistry.* 2002 May; 30(4) : 129-134.
  - 17Heinrich-Weltzien R, Weerheijm KL, Kühnisch J, Oehme T, Stösser L. Clinical evaluation of visual, radiographic, and laser fluorescence methods for detection of occlusal caries. *ASDC J Dent Child.* 2002 May-Aug; 69(2): 127-32.
  - 18Camila Pinelli, Mônica Campos Serra, Leonor de Castro Monteiro Loffredo. Validity and Reproducibility of a Laser Fluorescence System for Detecting the Activity of White-Spot Lesions on Free Smooth Surfaces in vivo. *Caries Res* 2002; 36: 19-24.
  - 19A.M. Lennon, W. Buchalla, L. Switalski, G.K. Stookey. Residual Caries Detection Using Visible Fluorescence. *Caries Res* 2002; 36: 315-319.
  - 20Anttonen V, Seppä L, Hausen H. Clinical study of the use of the laser fluorescence device DIAGNOdent for detection of occlusal caries in children. *Caries Res* 2003; 37: 17-23.
  - 21Chong MJ, Seow WK, Purdie DM, Cheng E, Wan V. Visual-tactile examination compared with conventional radiography, digital radiography, and Diagnodent in the diagnosis of occlusal occult caries in extracted premolars. *Pediatr Dent.* 2003 Jul-Aug; 25(4): 341-9.
  - 22Rocha RO, Ardenghi TM, Oliveira LB, Rodrigues CR, Ciamponi AL. In vivo Effectiveness of Laser Fluorescence Compared to Visual Inspection and Radiography for the Detection of Occlusal Caries in Primary Teeth. *Caries Res* 2003; 37: 437-441.
  - 23A. Lussi, P. Francescut. Performance of Conventional and New Methods for the Detection of Occlusal Caries in Deciduous Teeth. *Caries Res* 2003; 37: 2-7.
  - 24Heinrich-Weltzien R, Kühnisch J, Oehme T, Ziehe A, Stösser L, García-Godoy F. Comparison of different DIAGNOdent cut-off limits for in vivo detection of occlusal caries. *Oper Dent.* 2003 Nov-Dec; 28(6): 672-80
  - 25Pinheiro I V A, Medeiros M C, Ferreira M A, Lima K C. Use of laser fluorescence (DIAGNOdent) for in vivo diagnosis of occlusal caries. *J of Minimal Intervention Dentistry* 2004; 1(1): 48-51.
  - 26Isauremi Vieira de Assuncao Pinheiro, Maria Cristina Dos Santos Medeiros, Maria Angela Fernandes Ferreira, Kenio Costa De Lima. Use of Laser Fluorescence (Diagnodent) for in vivo diagnosis of occlusal caries: A Systematic Review. *J Appl Oral Sci* 2004; 12: 177- 81.
  - 27Reis A et al. Occlusal caries detection: a comparison of DIAGNOdent and two conventional diagnostic methods. *J Clin Dent.* 2004; 15(3): 76-82.
  - 28Shinkoku Naoko et al. The research on objective diagnosis of dental caries of permanent tooth occlusal surface in the initial stage. The relationship between measured values with explorer (probe) and DIAGNOdent. *Nihon University Dental Journal* 2004 ; 78 (3) : 159-164.
  - 29Mendes, Fausto Medeiros, Nicolau, Jose. Utilization of Laser Fluorescence to Monitor Caries Lesions Development in Primary Teeth. *Journal of Dentistry for Children* May-August 2004; 71( 2) :139-142.
  - 30Erten H et al. The assessment of unaided visual examination, intraoral camera and operating microscope for the detection of occlusal caries lesions. *Oper Dent.* 2005 Mar-Apr; 30(2): 190-194.

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## IMPROPER VERTICAL DIMENSION OF OCCLUSION CAUSE FOR TMJ PAIN

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### Abstract

Vertical jaw relations play an important role in success of complete dentures. Improper recording of vertical dimension of occlusion results in various consequences which hampers the health of oral musculature. This article presents a case report to emphasize the significance of recording proper vertical dimensions to improve function, comfort and esthetics.

### Key words

Occlusal Lesion. DIAGNOdent. Visual Inspection .Intraoral Camera.

### INTRODUCTION

The natural jaws bear a definite relation to each other, both at rest and during function. In natural dentition, presence of teeth makes it easy to determine the relationship of jaws to each other, but in edentulous patients absence of teeth makes it necessary for the dentist to determine and establish relationship between the jaws.

Boucher<sup>11</sup> classified jaw relations into three groups: orientation jaw relation, vertical jaw relations and horizontal relations. These three relations together help to determine the height of dentures and the way they are related to each other.

This article focuses on the importance of vertical jaw relations in edentulous patient. The vertical jaw relations are expressed as the amount of separation between maxillae and mandible under specified conditions. It depends on the TMJ and the tone of oral musculature. An increase or decrease in vertical dimension results in complications which leads to failure of prosthesis. Thus vertical jaw relations have to be established accurately for proper comfort, health of surrounding structures and functioning of the prosthesis<sup>11,12,13</sup>.

### CASE REPORT

A 65 year old female patient reported to the Department of Prosthodontics, PDM Dental College and Research Institute with the chief complaint of pain, difficulty in chewing and stiffness of face since 3-4 months. On history taking it was found that the patient was a denture wearer since past 20 years. During this duration patient changed three sets of dentures. Last denture was fabricated 4 years back. The complete dentures worn

by the patient were examined. Several authors claim that impaired dental efficiency resulting from partial tooth loss or incorrect prosthodontic treatment results in TMJ pain and dysfunction or even degenerative changes in the joints. Clinical examination revealed pain on palpation in TMJ region with pain referring to temporal region and base of skull. Oral musculature was found to be stiff and tender. A decreased facial height, loss of muscle tone, cheek biting, saliva drooping from the corners of mouth were observed (Fig: 1 and 2). OPG and TMJ radiographs were made to assess the condition of TMJs. However, X-rays did not reveal any significant disorder.



Fig 1: Pre-operative – Front view

Fig 2: Preoperative – Profile view

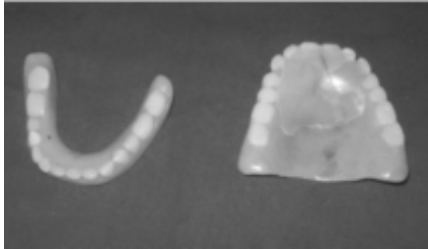
On examination of dentures, discrepancy of 10mm was found between vertical dimension of occlusion (VDO) and vertical dimension at rest (VDR) (that is VDR was 10mm more than VDO). This resulted in pseudo-prognathism (Fig: 3)

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with completely worn out teeth and denture bases (Fig: 4).



Diagnosis of loss of vertical dimension was made and fabrication of a new set of complete dentures were planned with improved vertical dimension.

#### PROCEDURE

Primary impression of maxillary and mandibular edentulous ridges were made using Pinnacle-impression compound and casts were poured in quick setting dental plaster.

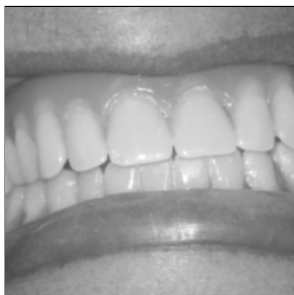
Custom trays were fabricated using autopolymerizing acrylic resins (DPI self cure acrylic resin). Trays were checked in patient's mouth and adjusted so that the borders of tray are uniformly 2 mm short of the sulcus and freni are adequately relieved.

Border molding was done using low fusing compound (DPI) and secondary impressions were made using Zinc oxide eugenol impression paste (DPI Impression paste).

Master casts were made. Temporary denture bases were fabricated using autopolymerizing acrylic resins and occlusal rims were made using modeling wax.

Tentative jaw relations were recorded with improved vertical dimensions, face bow transfer was done and transferred on to the semi-adjustable articulator.

Try-in was accomplished and complete dentures with balanced occlusion were fabricated with improved vertical dimension of occlusion (Fig: 5, 6 and 7).



Patient was recalled after one week and then after every 15 days for three months continuously. Relief in pain, marked improvement in function and esthetics was observed.

#### DISCUSSION

During the fabrication of complete denture, determination of correct vertical dimension of rest and vertical dimension of occlusion plays an important role. According to Winkler<sup>13</sup>, if the vertical dimension is altered appreciably in either direction (overclosed or unduly opened), problem in speech and mastication as well as TMJ dysfunction may result. Hagag G and Miura H<sup>9</sup> stated that improper vertical dimension may lead to temporomandibular joint disorder.

Kois JC<sup>7</sup> stated that alteration in occlusal vertical dimension can improve dentofacial esthetics, create improved visual proportions in facial height and provide an important treatment modality for improved masticatory system.

Owen WD<sup>1</sup> conducted a study and concluded that no destruction of tissue was observed with immediate increase in vertical dimension and patient's acceptance was reported to be good.

The case report presented in this article focuses on importance of vertical dimension in fabrication of complete denture. A complete denture with improved vertical dimension was made. Patient was completely comfortable with newly fabricated prosthesis. Pain completely disappeared and facial muscles were relaxed.

Mazetto OM and Abrao W<sup>6</sup> stated that periodic visits to the dentist by such patients with improved vertical dimension are an important factor for success of treatment not only in terms of prosthesis duration but also in terms of comfort. Thus besides routine instruction, dentist should orient the patient for regular check up to evaluate occlusion, vertical dimension, stability of prosthesis and condition of supporting tissues.

#### SUMMARY

Denture wearer patients present with pain in oral musculature and TMJ which could be attributed to improperly recorded jaw relations. A complete denture with improved vertical dimension was fabricated which resulted in improvement in comfort, function and esthetics of the patient. Improvement in facial height, tone of facial muscles along with reduction in pain on palpation in TMJ region were observed.

#### ACKNOWLEDGEMENT

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#### REFERENCES

1. Owen WD, Douglas JR. Near or full occlusal vertical dimension increase of severely

- reduced interarch distance in complete dentures. *J Prosthet Dent* 1971;26:134-138.
2. Pound E. Controlling anomalies of vertical dimension and speech. *J Prosthet Dent* 1976;36:124.
  3. Rugh JD, Drago CJ: Vertical dimension: a study of clinical rest position and jaw muscle activity. *J Prosthet Dent* 1981, 45:670-75.
  4. Toolson LB, Smith DE: Clinical measurement and evaluation of vertical dimension. *J Prosthet Dent* 1982; 47:236-241.
  5. Broekhuijsen ML, Van Willigen JD: Relationship of the preferred vertical dimension of occlusion to the height of the complete dentures in use. *J Oral Rehabil* 1984;11: 129- 138.
  6. Mazetto MO, Abrao W, Rodrigues Da Silva MA. Importance of periodic control after fitting a total prosthesis- Case Report. *Braz Dent J* 1990;1:51-54.
  7. Kois JC, Philips KM. Occlusal Vertical Dimension: Alteration Concerns. *Dental xp*:12/01/1997.
  8. The glossary of prosthodontic terms. *J Prosthet Dent* 1999;81:39-110.
  9. Hagag G, Yoshida K. Occlusion, Prosthodontic treatment and temporomandibular Disorders. *J Med Dent Sci* 2000;47:61-6.
  10. Gross M, Nissan J. The effect of increasing occlusal vertical dimension on face Height. *Int J Prosthodont* 2002;15:353-57.
  11. Zarb – Bolender : *Prosthodontic Treatment for Edentulous Patients*, Twelfth edition 2004, Mosby.
  12. Okeson JP. *Management of Temporomandibular Disorders and Occlusion*, edition 4. St Louis: Mosby, 1998:98-110.
  13. Sheldon Winkler. *Essentials of complete denture prosthodontics*, Second Edition, Ishiyaku Euro America, Inc. Publishers

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was found to be stiff and tender. A decreased facial height, loss of muscle tone, cheek biting, saliva drooping from the corners of mouth were observed (Fig: 1 and 2). OPG and TMJ radiographs were made to assess the condition of TMJs. However, X-rays did not reveal any significant disorder.

Fig 1: Pre-operative – Front view

Fig 2: Preoperative – Profile view

On examination of dentures, discrepancy of 10mm was found between vertical dimension of occlusion (VDO) and vertical dimension at rest (VDR) (that is VDR was 10mm more than VDO). This resulted in pseudo-prognathism (Fig: 3)

<p><b>Source of Support:</b> Nil, <b>Conflict of Interest:</b> None declared</p>
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## Osteopetrosis- A case report

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### Abstract

Osteopetrosis is a rare metabolic disease<sup>1</sup>. Dental abnormalities may be attributed to the pathological changes in osteopetrosis. Patients with osteopetrosis are especially susceptible to osteomyelitis of mandible<sup>1</sup>. A 13yr old girl presented with complaint of jaw swelling on left side. The radiograph of left mandible (oblique lateral view) showed small sequestrum with irregularity and erosions of the mandibular cortical margins. The patient was diagnosed as a case of osteopetrosis with superadded mandibular osteomyelitis-a rare entity.

### Key words

Osteoporosis, autosomal, malignant

### INTRODUCTION

Marble bone disease (Osteopetrosis; Osteosclerosis Fragilis Generalisata) is an inherited, rare autosomal bone disorder of unknown etiology. It was first described in 1904 by Albers Schonberg<sup>2</sup>, hence the disease also gets a name Albers Schonberg disease. This disorder includes impaired osteoclast function and marked increase in bone density.

The estimated prevalence of osteopetrosis is 1 in 100,000–500,000. It takes 2 major clinical forms-the autosomal dominant adult (benign) form is associated with few or no symptoms and the autosomal recessive infantile (malignant) form, if untreated, is typically fatal during infancy or early childhood.

A rarer autosomal recessive (intermediate) form presents during childhood with some signs and symptoms of malignant osteopetrosis. In especially rare cases, osteopetrosis may exist as lethal, transient infantile and post infectious forms. Most children born with the malignant form of osteopetrosis die during infancy. Due to better medical care the life expectancy of these patients has increased in recent years.

Most studies of osteopetrosis have concentrated on medical aspects (hepatosplenomegaly, anemia, increased susceptibility to infections most common is respiratory tract infections, cardiac disorders, multiple fractures etc)<sup>3</sup>.

With increasing age, however, dental development and tooth eruption become a practical and medical problem<sup>4</sup>. In these patients to improve oral hygiene, especially in areas of exposed mandibular bone,

0.2% chlorhexidine formulations can be used. Fluoride applications can be done to decrease the susceptibility to dental caries.

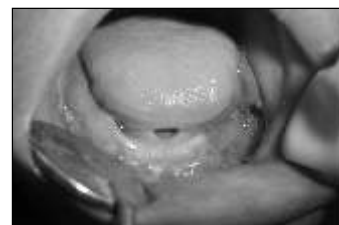
This paper discusses a rare case of osteopetrosis with mandibular osteomyelitis with the purpose to review the entity and to reemphasize an important, less obvious, clinical presentation of osteopetrosis with mandibular osteomyelitis.

### CASE REPORT:-

A 13yr old girl reported with the chief complaint of missing teeth. A detailed history was taken; patient had loss of vision and hearing impairment. Intraoral examination showed pale oral mucosa [fig.1],



small sequestrum on left side of the mandible [fig.2].



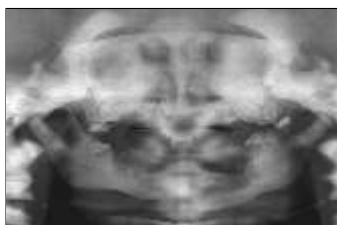
Investigations revealed following results: Abdominal

sonography was suggestive of splenomegaly (16.28×8.6 cm), homologous echo texture. Portal vein 12.6mm, whereas the size of liver, gall bladder, kidney were normal, no evidence of lymphadenopathy was seen.

The soft tissue attached to malformed tooth was sent for histopathologic examination which was suggestive of dentigerous cyst (possibility of follicle attached to the partially formed tooth) [fig.3]



The laboratory test revealed Hb 9 mg%, WBC 2.3×10<sup>9</sup>/L, DLC showed neutrophils 70% and lymphocytes 30%. Serum chemistry revealed Cl 106 mg/l and alkaline phosphatase 8.0 KA unit/dl. The skull radiograph and radiograph of left mandible (oblique lateral view) showed increased bone density. The O.P.G X-ray [fig.4]



showed that all permanent tooth bud remained totally or partly embedded in basal bone. Vertical growth of alveolar ridge was very limited. Where a fenestration of overlying mucosa had occurred, a localized, progressive osteitis developed, leading to soft tissue inflammation.

It has been documented that classical features of osteopetrosis can be misdiagnosed in cases of Kaffey's disease, Myelofibrosis, Skeletal fluorosis, hypoparathyroidism. The confirmatory test would be using brain iso-enzyme of creatine kinase which is a biochemical marker of osteopetrosis.<sup>2</sup>The patient was diagnosed as a case of osteopetrosis with superadded mandibular osteomyelitis.

### DISCUSSION

Osteopetrosis is a rare metabolic disease characterized by a generalized increase in skeletal mass. This inherited disorder results from a congenital defect in the development or function of the osteoclast. Orthopedic problems in the intermediate and autosomal dominant forms include bone pain (26% of patients), increased fractures (40%) coxa vara, long bone bowing, hip and knee degenerative arthritis and osteomyelitis.

Dental abnormalities may be attributed to the pathological changes in osteopetrosis. Patients with the disease seem to be especially susceptible to caries. Constriction of canals housing neurovascular bundles that supply teeth and jaws, along with obliteration of the marrow cavities and the dental pulp chambers, is the most likely contributing factor to bone necrosis and dental caries. Other dental changes may include delayed eruption and early loss of teeth, enamel hypoplasia, malformed roots and crowns, and thickening of the lamina dura.<sup>5</sup>

Osteomyelitis, due to dental caries (10%), is well recognized hazard in osteopetrosis due to reduced blood circulation to bone as a result of obliteration and fibrosis of the marrow. It is a potentially severe

infection that runs a protracted course, due to the accompanying severe anemia and neutropenia.<sup>6</sup>

The most common complication of the osteopetrosis is pathologic fractures; those with congenital presentation are likely to have the most fractures. Femoral shaft fractures either with transverse or short oblique pattern are most common. Other common locations are inferior neck of femur and posterior tibia. Upper extremity fractures are also reported. Fracture healing seems to occur at a normal rate but the onset of callus formation after injury is variable.<sup>7</sup> Nonunion & delayed union of fractures may occur. Management of the patients with osteopetrosis requires a comprehensive approach to characteristic clinical problems including hematological and metabolic abnormalities, fractures, deformity back pain, bone pain, osteomyelitis and neurological sequelae. Medical management of osteopetrosis is based on efforts to stimulate host osteoclasts on provide in alternate source of osteoclasts. Stimulation of host osteoclast has been attempted with calcium restriction, calcitriol, steroids, parathyroid hormone and interferon. Hyperbaric oxygen has been shown to be beneficial in the treatment of mandibular osteomyelitis<sup>8</sup>. It has a bactericidal and bacteriostatic effect in vitro and in vivo but the bone infection is not the only factor but reduced tissue resistance due to avascularity of the marrow spaces and the partial obliteration of the mandibular canal appeared to be the basic problem. The beneficial effect is probably resulted from the improved vascular supply and increased oxygen perfusion to the ischemic areas of infection.<sup>9</sup>

Bone marrow transplantation is the only permanent cure for osteopetrosis, but an appropriately matched donor is usually available for only about 50% of those affected, and engraftment is successful in about 45% of transplants.<sup>10</sup> As osteopetrosis likely represents a spectrum of underlying etiologies resulting in osteoclast dysfunction, effective therapies need to be individualized. These patients should receive increased attention and prophylactic dental treatment to maintain their fragile oral health status. Frequent oral hygiene procedures with emphasis on chlorhexidine mouthwash should be advocated.<sup>2</sup> Preventive measures must be continuously and rigorously maintained in patients of osteopetrosis for the prevention against dental caries. Fluorides and diet counseling would be the mainstay for long term maintenance of oral health. Presence of bony sequestrum and cysts are common findings of this entity. Soft tissue infections, periodic exacerbations and remission of pus through numerous sinus tracts often make surgical intervention necessary. Complete dentures continue to have an important role in the treatment of edentulous patients. Edentulous ridges though the feature of old age can be seen in pediatric dental patients being affected by certain syndromes and as seen in this case also. Prior to treatment, diagnostic casts were obtained using irreversible hydrocolloid (putty) [fig.5].



Custom tray was fabricated using self cure acrylic which was used later to make secondary/final impression [fig.6].



Conventional border molding procedure with modeling plastic impression compound sticks was done on the fabricated custom trays. After border molding was completed secondary impression was made with the help of zinc oxide eugenol impression pastes and casts were poured. Occlusal rims were fabricated [fig.7] and jaw relations were recorded in centric



relation. Complete denture is verified for esthetics, phonetics and necessary correction were made [fig.8]. Denture was



delivered and patient recalled next day for post insertion. Prosthetic treatment includes partial or complete dentures. The maxillary dentures are well retained and well accepted by the children. The mandibular dentures often have poor stability and retention due to mandibular destruction both because of the pathology and the surgical intervention. In practice only the maxillary dentures are used.<sup>4</sup>

### CONCLUSION

Complete prevention of this complication is not currently possible. Normal growth is a balance between osteoblastic (cells that create new bone tissues) and osteoclastic (cells that destroy old bone tissue) activity. In osteopetrosis, the osteoclasts do not function properly, leading to fragile bone status. So, the aim of our therapy should be not only to treat the oral complaints of patient but to provide a complete physical, mental, psychological rehabilitation of the patient so that he/she may lead a normal healthy life.

### REFERENCES

1. I Ahmad, Sz Abbas, F Haque, M Rashid, SA Ahmad; "Osteomyelitis of Mandible"-A Rare Presentation of Osteopetrosis. *Ind J Radiol Imag* 2006 16:2:253-256.
2. David K. Lam, George K.B. Sándor, Howard I. Holmes, Robert P. Carmichael, Cameron M.L. Clokie; *Marble Bone Disease: A Review of Osteopetrosis and Its Oral Health Implications for Dentists*; *JCDA*; November 2007, Vol. 73, No. 9:839-843.

3. Callum J Wilson; *Autosomal recessive osteopetrosis*; orphanet encyclopedia march 2003.
4. Kjell Bjorvatn, Ole Gilhuus-Moe and Dagfinn Aarskog; Oral aspects of osteopetrosis; *Scand. J. Dent. Res.* 1979; 87: 245-252.
5. Dick HM, Simpson. J Dental changes in osteopetrosis. *Oral Surg* 1972 sept; 34:408.
6. Lawoyin DO, Daramola JO, Ajabge HA, Nyako EA, Lawoyin JO. Osteomyelitis of the mandible associated with osteopetrosis: Report of a case. *Br J of oral and max surg.* 1988; 26:330-5.
7. Stoker DJ. Osteopetrosis. *Semin musculoskel radio.* 2002dec; 6(4):299-305.
8. Mainous EG, Boyne PJ, Hart GB. Hyperbaric oxygen treatment of mandibular osteomyelitis: Report of three cases. *J am dent assoc* 1973; 87:1426.
9. Mainous EJ, Hart GB, Soffa DJ, Graham GA. Hyperbaric oxygen treatment of mandibular osteomyelitis in osteopetrosis. *J oral surg* 1975 April; 33:288-291.
10. Neville BW, Damm DD, Allen CM, and Bouquot JE. Bone pathology. In: *Oral and maxillofacial pathology.* 2nd ed. China: Saunders; 2002.p. 533-87.

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## MANAGEMENT OF IMPACTED PERMANENT FIRST MOLAR- A Case Report

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### Abstract

The impaction of a maxillary permanent first molar is rare. This present case was interesting because the tooth was not erupted into the oral cavity for more than six years. It was vertical and covered with a thick band of mucosa and bone. We did surgical exposure of the tooth as soon as possible and maintained the patency of the wound for its eruption. If not treated early it may lead to development of dentigerous cyst or other pathological lesions. The successful eruption of the tooth into oral cavity will help the child for better function and occlusion.

### INTRODUCTION

The definition of an impacted tooth is "A tooth that cannot erupt into its normal functioning position and is pathologic and therefore require treatment". The third molars are the most frequent impacted tooth followed by maxillary permanent canines and mandibular second premolars rank 3rd in frequency of order of impaction. The impaction of first permanent molar is extremely rare. Dachi and Howell, 1961 found the incidence of impacted canine in maxilla is 0.92% and of other non-third molar impaction is to be 0.38%. The first permanent molars seem to be impacted more frequently than the second permanent molars.

In most of our review of literatures it was found that impaction of first permanent molars are due to ectopic eruption and it may cause resorption of distal root of deciduous second molars or even premature exfoliation of the same.

The causes for impaction are both systemic and local. Systemic factors like endocrine deficiency (hypothyroidism and hypopituitarism), febrile disease, irradiation, down's syndrome and cleidocranial dysostosis may influence impaction of permanent teeth. In all these conditions generally multiple teeth are involved. The local factors which are more commonly involved in permanent tooth impaction are prolonged retention of deciduous tooth, premature loss of primary molars, arch length deficiency, supernumerary tooth, malposed tooth germ, abnormal path of eruption, trauma and cleft lip and palate. Dentigerous cyst, ankylosis of primary molars, odontomes and supernumerary tooth may be the cause for molar impaction. Raghoebar and Colleague, 1991 stated that impaction of first permanent molar was often diagnosed as ectopic eruption, whereas impaction of second permanent molar is associated with arch

length deficiency.

### CASE REPORT:

The present case is a 12 year old boy who reported to the department of Pedodontics and Preventive Dentistry at Himachal Dental College, Sundernagar, H.P. with an impacted maxillary permanent first molar (#26). The other three molars were erupted in time and they were well in occlusion. On palpation the impacted molar could not be felt on buccal or lingual position. There was no deficiency of arch length in this present case. The intra-oral periapical radiograph showed vertical position of the impacted tooth with a thick band of mucosa and bone covering the crown of the tooth. The second permanent molars were not erupted and they were well in place i.e. there was no mesial migration of 27 causing impaction of 26. The patient gave a history of an accident at 5 years of age which is reflected through a scar tissue present on his face. There were no other causes for impaction of 26 except that of local trauma. In this present case there was also delayed eruption of tooth # 23, 24 and 25 which were erupting spontaneously.



### Preoperative Photographs (Extraoral and Intraoral)

On the basis of following diagnosis a decision of surgical exposure of the impacted tooth was made. Prior to surgical procedure routine blood and urine examination were carried out which were within normal limit. The operation was performed under

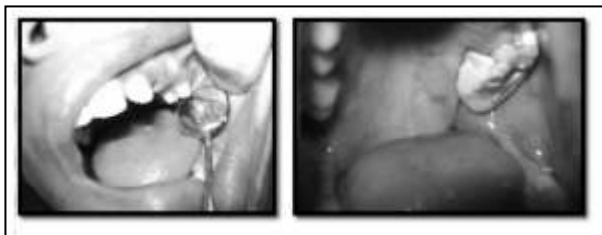
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local anesthesia. A circular incision was given in the mucosa around the crown of the impacted tooth to remove the thick band of soft tissue. With a surgical bur the bone above the crown of the impacted tooth was removed along with copious flow of normal saline. When the crown was exposed, it was irrigated with normal saline to remove any bony spicules and debris. The hemorrhage was arrested with pressure pack. The surgical wound was then packed with a coe-pack to prevent epithelization of the crown. It was necessary to change the coe-pack repeatedly after thorough irrigation. The patient was asked to maintain good oral hygiene and a chlorhexidine mouth rinse was prescribed for plaque control.



**Surgical exposure**

**Placement of Coe-pack**



**After 1 month**



**After 9 months**

Routine check up and radiographs were taken after regular interval to assess the improvement of eruption of the tooth. The tooth is now erupted into the oral cavity.



**Pre-operative radiograph**



**After 1 month of surgery**



**After 6 months of surgery**

### **DISCUSSION:**

The management of an impacted tooth often necessitates a complex surgical and orthodontic treatment. In this present case we opted for surgical exposure only and periodic follow up for its eruption. The permanent first molar was impacted for more than six years which made us to opt for surgical exposure as soon as possible. The tooth was spontaneously erupting but very slowly. This is because the erupting force of the tooth was negligible owing to the completion of the root formation. It took 9 months for complete eruption of the tooth in the oral cavity. In this case a light (40gms to 60gms) orthodontic force would have been better for eruption guidance for faster eruption.

Kokich, 1993 described the surgical and orthodontic management of impacted tooth and identifies the position and angulation of the impacted tooth, length of treatment time, space availability and the presence of keratinized gingiva as a critical factors that will affect prognosis and treatment outcome. The cost involved in orthodontic traction for impacted tooth may also influence the type of treatment options. In this present case we did not go for orthodontic traction because the patient would not be able to afford it. Other factors such as patients medical history, dental status, oral hygiene, functional and occlusal relationship, attitude towards orthodontic treatment and compliance with treatment will influence the choice of treatment options.

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The successful management of an impacted permanent first molar by surgical exposure followed by placement of a coe-pack to maintain the patency of the wound for eruption of the tooth is not new. This case is an unique example because the thick fibrous band of mucosa and bone over the impacted permanent first molar did not allow the tooth to erupt but at the same time the tooth was not ectopically erupting. It was impacted for more than 6 yrs and there was no pathological lesion developed over the crown. If not treated early the corresponding mandibular first permanent molar will passively erupt and it may cause traumatic occlusion later on. There may be development of dentigerous cyst, pre-eruptive caries, periodontal problems

or infection from the impacted tooth. Therefore, an impacted permanent first molar should be treated as and when it was diagnosed. Surgical removal of the impacted permanent first molar is indicated where there is no hope for its eruption and when it causes pathological root resorption of the adjacent tooth or when it causes severe arch length deficiency leading to impaction of the second permanent molar. In all circumstances one should try to preserve the permanent first molar for better occlusion and function. Acknowledgement

Dr. Anshul Sachdeva, P.G student 2nd year, to keep all the records of the patient as well as corresponding to the patient in time.

#### REFERENCES:

1. Dachi SF, Howell FV. A survey of 3,874 routine full mouth radiographs II. A study of impacted teeth. *Oral Surg Oral Med Pathol* 1961;14:1165-9
2. Raghoebar GM, Boering G, Vissink A, Stegenga B. Eruption disturbances of permanent molars: a review. *J Oral Pathol Med* 1991;20:159-66.
3. Peck S, Peck L, Kataja M. The palatally displaced canine as a dental anomaly of genetic origin. *Angle Orthod* 1994;64:249-256.
4. Chaushu S, Sharabi S, Becker A. Dental morphologic characteristics of normal versus delayed developing dentitions with palatally displaced canines. *Am J Orthod Dentofacial Orthop* 2002;121:339-346.
5. Kokich VG, Methews DP. Surgical and orthodontic management of impacted teeth. *Dent Clin North Am* 1993;37(2):181-204.
6. Bishara SE. Impacted maxillary canine: a review. *Am J Orthod Dentofacial Orthop* 1992;101:159-171.
7. Ohman I and Ohman A. The eruption tendency and changes of the direction of impacted teeth following surgical exposure. *Oral Surg Oral Med Oral Pathol* 1980;49:383-9.
8. McNamara C. and McNamara T. G. Mandibular premolar impaction: 2 case reports. *J Can Dent Assoc* 2005; 71(11):859-63.
9. Grover PS, Lorton L. The incidence of unerupted permanent teeth and clinical cases. *Oral Surg Oral Med Oral Pathol* 1985; 59: 520-5.

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## REIMPLANTATION OF EMBEDDED MAXILLARY CANINE AFTER ROOT CANAL TREATMENT EXTRA-ORALLY

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### INTRODUCTION

Attempts to re-implant teeth have been carried out from time almost immemorial. Ambroisepare Paral who practiced in France in 1579 described replanting, extracting and putting back into the socket again.

In 1785, Dr. Josiahflaggl of Boston informed the public, that he could replant the teeth both dead and alive.

Since then many dentists resorted to these techniques with not much success.

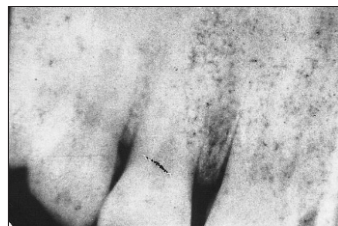
Today, however, with the modern prophylactic use of antibiotics, improved techniques of asepsis and advanced knowledge of tissue response, better results should be obtained.

### CASE REPORT

A 21 year old girl reported the department with the complaint that she had an ailing upper tooth, which was source of spordiac swelling, pain and tooth was shaky and discolored.

### INTRA-ORAL EXAMINATION

On making the intra oral examination, the patient had all the permanent teeth erupted, in excellent health. There were no caries, no gingival disease, excepting that upper right milk canine was retained, shaky with gingival abscess around it. (Fig 1)



Extraction of the tooth was advised to relieve the recurrent abscess in the mouth of the patient. The patient however, enquired about the post extraction options for filling the space.

In 1999 implants were not being practiced in Jammu, therefore a removable partial denture or a crown or bridge were explained and suggested to the patient. The patient declined both the alternatives and

enquired the reasons of not having her permanent canine. An intra oral radiograph was taken, which revealed upper right canine to be embedded deep in the palate. (Fig 2)



The patient insisted that somehow this tooth should be utilized in place of milk canine. All aspects regarding a difficult surgery and re-implantation of permanent canine were explained to the patient and her parent's accompanying her. The patient and parent's agreed to it, a written consent was taken for surgery and photography of the patient.

As the patient was healthy, without any physical ailment, she was put on antibiotic for performing the surgery next day. On the following day milk canine was extracted and flap was raised to locate the upper permanent canine. Bone cutting was done from buccal side but the tooth could not be located, therefore palatal assess was taken. After raising palatal flap, a bulge in the palatal plate could be seen. Bone cutting was done; the tooth was lying deep along the roots of upper right central and lateral incisors and was more in horizontal placement to the long axis of central and lateral incisors, quite contrary to how it looked in the radiograph. With a lot of manipulation tooth was extracted and kept in a tray containing normal saline in it. This tooth was quite a long and could not be accommodated in socket of milk canine; therefore 3-4 mm apex was cut and root canal filling was done after the removal of neurovascular tissue. Apex was shaped to avoid mechanical irritation. The socket was also modified to accommodate the tooth which was re-implanted and splinted with acrylic. Patient was kept on antibiotic and anti-inflammatory drugs for one week. After 8 weeks the splint was removed. Tooth had significant stability and patient was satisfied.

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A radiograph was repeated after three months (fig 3)



bone formation was taking place, there was no soft tissue problem excepting little of gingival shrinkage. After one year another x ray was taken. (Fig 4)



Crestal bone formation was quite significant, there was no mobility of the tooth, a porcelain cap was given and patient felt quite happy and satisfied. Fig 5



(without crown). The patient was recalled after 11 years Dec 2009 for a follow up and the canine is seen to be perfectly well placed with excellent aesthetics.

#### DISCUSSION

Utilization of embedded teeth is quite an old technique. In the absence of appropriate option available and the patient not accepting partial denture or crown and bridge to avoid drilling of the healthy teeth, the embedded tooth can be used for the satisfaction of the patient. If possible tooth should be moved to place by orthodontic treatment, otherwise extraction and re-implantation is also a good option with quite a good success as experienced in the above case. It is however imperative that one must be quite experienced to extract such embedded teeth placed remotely in the jaw without damaging the adjacent teeth and there is an utter need for the complete asepsis and adequate handling of extracted tooth for success of such operation.

#### REFERENCE

1. Oral surgery, Kurt H Thoma 4th Edition.
2. Peterson's Principles of Oral and Maxillofacial Surgery, 2nd Edition.
3. Spiechowicz E, Gawor E et al. Reimplantation, bone augmentation, and implantation procedures for impacted maxillary canines: a

clinical report. J Prosthet Dent. 2004 Mar;91(3):223-7.  
4. Penarrocha M, Garcia-Mira B et al. Extraction of impacted maxillary canines with simultaneous implant placement. J Oral Maxillo fac Surg. 2007 Nov;65(11):2336-9.

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## BIOMIMETICS - A REVIEW

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## INTRODUCTION

Bio: meaning life and mimesis meaning imitation are derived from Greek. Biomimetics is the field of scientific endeavor which attempts to design system and synthesize materials through biomimicry. It's the concept of taking ideas from nature and implementing them in another technology such as engineering design computing etc. The subject matter of biomimetics is known by several names bionics, biognosis etc.

The concept is very old but the implementation is gathering momentum only recently because the science base can cope with the advanced techniques and our civilization is in ever increasing need of sympathetic technology.

Biomimetics is an emerging inter disciplinary field that combines information from the study of biological structures and their function with physics mathematics chemistry and engineering in the development of principles that are important for the generation of novel synthetic materials and organs.

## HISTORY

The name biomimetics was coined by Ottoschmit in the 1950s. The term bionics coined by JackE.Steele in 1960 at a conference in Dayton.

The foundation of this broad new field has ancient roots. Replacing body parts goes back at least 2,500 years when bridges made them artificial teeth carved them the bones or oxen . Evidence of crude dental implants dates back to roman population of the first or second century AD and to pre-Columbian cultures of central and south America . The first use of dental amalgam to repair decayed teeth was recorded in the Chinese literature in the year 659. The middle of 20th century saw sophisticated inventions in the heart pacemaker the artificial heart valve and hip and knee joint replacement historically organ and tissue loss have been treated by surgical reconstruction and more recently the use of mechanical devices such as kidney dialyzers and the transplantations of organs from one individual to another.

## REGENERATION OF DENTAL STRUCTURES

Regeneration of the dentin pulp complex :- The recombinant human BMP2 and BMP4 can induce new dentin . Recombinant BMP delivered in a scaffold of demineralized dentin matrix induces classic tubular dentin in amputated pulp where as BMP delivered using reconstituted type I collagen matrix induces instead osteodentin . Reparative dentin is also induced on freshly cut healthy pulp tissue in nonhuman primate using recombinant human BMP7 with an insoluble type I collagen matrix. The size and shape of the inductive material controls the size and shaped of the reparative dentin. The reparative dentin appears initially with cellular and soft tissue inclusions a portion of which (comprising only about 20% of the reparative dentin ) subsequently changes into a more tubular form of matrix with associated odontoblast like cells attached to the mass of a tubular matrix. Therefore the extra cellular matrix scaffolding is a critical component and a prerequisite to odontoblast differentiation and tubular dentin formation.

Periodontal regeneration :- The periodontium which consist of cementum PDL and alveolar bone functions to anchor the teeth to the jaws. The morphogenetic potential of BMPs makes them ideal candidates for use in periodontal regeneration optimizing the response of stem cells to BMP induction requires the use of a delivery system that is conducive to the migration and attachment of the responding stem cells on to the scaffolding using a baboon model recombinant BMP7 and baboon type I collagen has been used as a biomimetic scaffold to regenerate surgically created function defects in molars. The formation of alveolar bone and the creation of cementum and sharpey's fibers inserted at the optimal orientation into the root surface. Platelet rich plasma (PRP) used in different surgical procedures. It consists of thrombocyte concentrates and high amounts of growth factors (GFs) especially platelet derived growth factor (PDGF), insulin like growth factor (IGF -I) and transforming growth factor (TGF- beta ) which are important in wound healing and regeneration combination of PRP and tricalcium phosphate can be

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used in the treatment of periapical inflammatory lesion. Platelet gel biotechnology a method which has all the components of "tissue engineering" techniques with healing process of guided tissue regeneration procedures (GTR) by multiplying the number of molecules that activate the healing response and by grafting in the host site various cell types among which stem cell ho is applied to regenerative surgery of intrabony defects in patients with refractory generalized aggressive periodontitis.

## THE BIOMIMETIC PRINCIPLE IN RESTORATIVE DENTISTRY

- The goal of biomimetics in restorative dentistry is to return all of the prepared dental tissues to full function by the creation of a hard tissue bond that allows functional stresses to pass through the tooth drawing the entire crown into the final functional biologic and esthetic result. Bonded porcelain restorations are recommended to treat the most perilous situation (non vital or fractured teeth) thus avoiding the use of intraradiucular parts or full coverage crowns e.g.- inlay onlay laminates cemented with the adhesive resins.
- The low elastic modules of most composites can never fully compensate for the loss of strong proximal enamel ridges especially in extremely large class II restorations. In these situations including those with cusp coverage indirect ceramic inlays onlays seem to be best alternative. In case of total occlusal coverage invital teeth with a short clinical crown ceramic indirect overlays are indicated.
- With the development of improved adhesives and immediate dentin sealing the use and indications for base lines have decreased. This group of materials traditionally performs many different function including the partial lining as a biologic protection for deep preparation areas the total lining for the dentin insulation against chemical or thermal injuries and the dentin replacement as a base prior to further restoration procedures. The indication for placing a linear under on adhesive restoration is mainly for pulp protection in the form of a partial lining using Ca (OH<sub>2</sub>) cements. Modern adhesives are capable replacing the total living function of former varnishes and cements. Base materials are mainly indicated to reduce the volume of the inlay/ onlay (e.g.- excessive depth) and to create an adequate preparation geometry by providing an even cavity floor and filling up internal undercuts.
- Endodontically treated teeth are more susceptible to fracture not because of pulp removal but due to the increased strain resulting them tooth substance loss. For posterior teeth total cuspal coverage with porcelain is recommended as it will significantly stiffen the crown and increase cusp stabilization for vital teeth. A composite resin base is indicated to reduce the volume of the inlay/onlay and to create an adequate preparation geometry (by providing an even cavity floor and filling up internal undercuts)

## DEVELOPMENT OF ARTIFICIAL SALIVARY GLAND

Many people suffer a loss of salivary gland function as a result of radiation treatment for head and neck cancer, and also many people affected for sjogren's syndrome an autoimmune disease whose symptoms include dry mouth and dry eyes without adequate saliva patient may experience difficulty in speaking, chewing and swallowing.

The application of state-of-the-art methodologies include the use of adult and embryonic stem cells for the regeneration of the salivary

glands, parenchyma and restorations of its secretory functions.

Efforts have focused on creating a rather simple device a "blind-end-tube" suitable to graft in the buccal mucosa of patients whose salivary parenchyma has been destroyed. The lumen of these tubes would be lined with compatible epithelial cells and be physiologically capable of unidirectional water movement. A realistic opportunity to develop a first generation artificial salivary gland suitable for clinical testing is believed to exist.

## BIOMATERIALS

**Synthetic Polymer:** The polymer can be biodegradable or non degradable. biodegradable polymers include polylactic acid and polyglycolic acid and co polymers. These polymers are used as suture materials but are also being examined for usage such as bone, skin and liver substitutes. These polymers are broken down in the body hydrolytically to produce lactic acid and glycolic acid. Newer biomaterials are polyanhydrides, Polyphosphazenes. Polymethyl Methacrylate (PMMA), Polytetrafluoroethylene (PTFE) and PMMA, polyhydroxyethylmethacrylate (PHEMA) may be described as alloplastic, synthetic, Nonbiodegradable polymers. PMMA used for dentures and as a cement for many orthopedic prosthesis. PTFE used for augmentation and guided bone regeneration.

## CERAMICS

It is used in dental applications and are being examined for bone tissue engineering application. Two common ceramics used in dentistry and hip prosthesis are alumina and hydroxyapatite. Alumina has excellent corrosion resistance, high strength, high wear resistance. Hydroxyapatite is a calcium phosphate based ceramic and it is a major component of inorganic compartment of bone.

## BIOMIMETIC PRINCIPLES IN DENTAL IMPLANT

Ceramics such as the calcium phosphate hydroxyapatite and various types of aluminum oxides are proved to be bio compatible and they are coated to implant which increases osteointegration.

## SCOPE

- Biologist study biomimetics not only for an understanding of the biological processes but also to trace the evolution of various classes of organism biochemist have interest in the field due to the complexities associated with the interaction of biopolymers with ions of metal leading to the mineralization in living organisms.
- On the whole the field of biomimetics addresses more than one issue those engaged in this field of research activity try to mimic natural method of manufacture of chemicals in order to create new ones, learn new principles from phenomenon observed in nature, reproduce mechanism found in nature and copy the principles of synthesizing materials under ambient conditions and with easily available raw materials. Design of biodegradable scaffolds to serve as platforms for cells to organize tissues for repair and regeneration of teeth and periodontal tissues. Develop biodegradable synthetic polymers for gene therapy identify isolate culture and characterize multipotent stem cells for adult tissues type for repair of TMJ associated structures.

## CONCLUSION

There is a need for a firmer scientific and technical basis in order to develop the next generation of medical implants that are safe reliable

smart and long lasting integrated and multidisciplinary research should advance our understanding of biological system and provide the basis for the design and development of normal synthetic medical materials that are compatible with the environment of the host and significantly increase the functional life time of implants. Future advances in this field will require materials and computer scientist, physicists, bioengineers, clinicians, biologist and industries working together towards a shared vision rather than pursuing their separate objectives.

#### **REFERENCES**

- Dr. Anuradha s , Dr. Nanda kumar k. JIDA 2002;73: 227-232.
- P Ramchandra Rao, Sadhana. VOL 28 parts 3, 4 june, august 2003, tp 657-676.
- Pascal magne. JCDA 2006 ;34: 2
- Nisako nakasima and Hari reddy. Nature biotechnology 2003; 21:9

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