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The Dental Water Jet

The dental water jet, also called water flosser or the oral irrigation device was invented by Dr. Gerald Moyer, a dentist, and John Mattingly, an engineer, in Ft. Collins, Colorado, in the late 1950s. The dental water jet, also known as an oral irrigator, was introduced to the dental profession in Texas during the 1962 Dallas Dental Convention. Numerous studies measuring the irrigator's efficacy in different cohorts have been published in peer-reviewed journals, but its possibilities are underused.

Though the standard dental floss is generally considered the most effective tool for cleaning the tight spaces between the teeth, a water flosser, also known as an oral pulsating irrigator, is a device that aims a stream of water at the teeth and helps remove food particles from the teeth, help reduce bleeding and gingivitis and can aid in reduction of bacteria even below the gumline.

Many have heard that a water flosser cannot remove plaque, likely because simple swishing with water is ineffective against plaque. But the research tells a different story. When compared to traditional string floss, water flossing has been shown to be significantly better for removing plaque and reducing bleeding and gingivitis. A study at the University of Southern California Center for Biofilms found that a three-second water flossing application removed 99.9% of plaque biofilm. The researchers observed via scanning electron microscopy that the combination of pulsation and pressure produced by the water flosser created shear hydraulic forces that effectively removed the plaque biofilm.

The water flosser has been found to be safe and effective for patients who have diabetes, patients in periodontal maintenance, patients with implants, and patients with orthodontic appliances.

While use of an oral irrigator was once considered taboo for patients prone to infective endocarditis, the research today tells us that the rate of bacteremia from water flossing (7%–50%) is similar to the rate of bacteremia from traditional brushing and flossing (20%–68%) or even from chewing food (7%–51%).

As different irrigation or water-flossing devices now on the market offer different features, designs, and combinations of pulsation and pressure, clinicians must consider the needs of individual patients and supporting research in selecting a model that the patient will like and use, and that will provide improved oral health.

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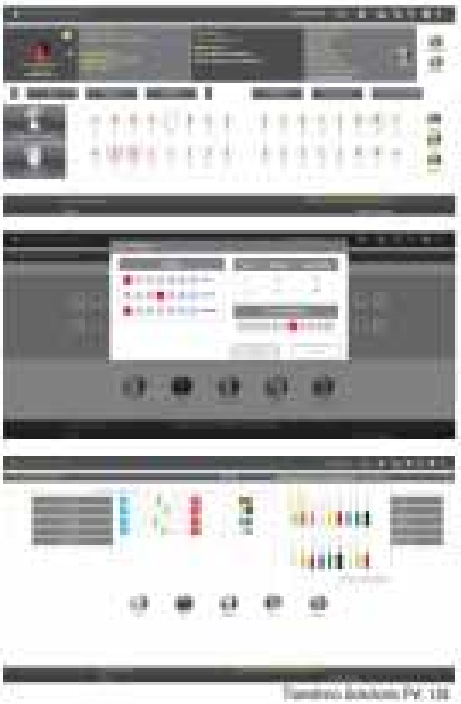

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Editorial

Dr. Anjana G.

Welcoming all readers to the first edition of KDJ in 2020.

The emergence of newer infectious diseases like COVID-19 are creating world-wide alarm. Hand hygiene and clean care becomes a very important aspect of controlling the spread of such diseases.

Clean care for all – it's in your hands is the WHO motto.

WHO calls on everyone to be inspired by the global movement to achieve universal health coverage (UHC), i.e. achieving better health and well-being for all people at all ages, including financial risk protection, access to quality essential health care services and access to safe, effective, quality and affordable essential medicines and vaccines for all. Infection Prevention and Control, including hand hygiene, is critical to achieve UHC as it is a practical and evidence-based approach with demonstrated impact on quality of care and patient safety across all levels of the health system.

Infection prevention must be made a priority in any dental health care setting. Make sure that your clinic has system for early detection and management of potentially infectious persons at initial points of patient encounter. Develop and maintain written infection prevention policies and procedures appropriate for the services provided by the clinic including Respiratory hygiene/cough etiquette, Sterilization of instruments and devices and maintenance of clean and disinfected environment and surfaces . Provide materials necessary for adherence to Standard Precautions (e.g. Masks and hand hygiene products, safer devices to reduce per- cutaneous injuries, personal protective equipment etc). Assign at least one individual trained in infection prevention responsibility for coordinating infection control. Key Recommendations for HAND HYGIENE in Dental Settings are to avoid bare handed touching of instruments, equipment, materials, and other objects likely to be contaminated by blood, saliva, or respiratory secretions and perform hand hygiene before and after treating each patient and before putting on gloves and immediately after removing gloves.

Dr Anjana G.
Editor, KDJ

Dr CC Joseph

Dear colleagues,

As we celebrate 100 years of Dentistry in India after Dr. Rafiuddin Ahmed started the first dental college in Kolkotta, India, and as we dentists in Kerala are all set to celebrate the 52nd year of IDA kerala state branch, I am fortunate to take this oath as the 50th president of our prestigious branch.

With a profound sense of gratitude, I sincerely thank all the members of the Indian Dental Association, kerala state for placing your confidence in me and giving me an opportunity to serve you in this coveted post as the President of ida kerala state . The strength of our association lies in its members and I am merely your representative. I will work with utmost sincerity and to the best of my ability to try and take our association to a step forward.

If I may quote Sir Issac newton, who said, "if I could see further, it is by standing on the shoulders of my giant fore fathers".

Here, the credit goes to the 49 past presidents and 18 past secretaries, along with all the other state office bearers so far, who have laid the foundations for the Kerala state ida branch.

It is indeed a great honour for me to assume office as the 50th president of Ida kerala state and I shall strive my best to follow the foot steps of my predecessors and at the same time, try to think of solutions out of the box too.

IDA Kerala state branch stands to uphold the dignity and respect of dental profession, to protect the rights and interests of its members, to implement well formulated schemes for the social and professional security of its members and also most importantly to foster friendship, co operation and co existence.

Dentistry - which is earning us our daily bread is constantly evolving and fast advancing . We as dental surgeons need to constantly update our knowledge to keep abreast with latest developments.

As we all know, the dental health care system in our country is facing many a challenge. To meet these challenges we need certain structural changes to make it more sustainable and respectable.

To achieve this goal, at the outset, we need to have A VISION AND A MISSION.

My Vision for the association is to improve oral health and the quality of life by achieving optimal oral health for all across India in general, and Kerala in particular. We also aim to represent the dental profession and support its members in the provision of comprehensive and quality oral health care.

Mission

IDA is dedicated to support dental professionals in their practice by enhancing and updating their skills and knowledge.

The association is the nation's most respected leader in promoting oral health, tobacco cessation and early cancer detection to improve quality of life and eliminate oral health disparities. Let me repeat, IDA's mission is optimal oral health for every Indian citizen.

Every patient we treat deserves sympathy, empathy and compassion..

Empathy is a key factor …..we can experience it, as we put ourselves in the patients' shoes. We must always try to develop an empathy towards our patients

Sympathy …..is acknowledging our patients emotional hardships and then providing comfort and assurance. They deserve the utmost sympathy, because there is never any joy in becoming sick.

When we combine empathy and sympathy—we have compassion. Compassion is something we need to inculcate in our daily practice especially as heath care providers.

Next year's pioneer projects are :…….

Message from the President

SHRADHA ;

Our MOTTO

"Oral health, overall health ,"

In this modern era of women empowerment we are planning to conduct classes for Kudumbasree workers and Asha workers for better oral health education.

"SANJEEVANI" : Cancer care project which is a comprehensive early cancer detection project in association with Kochi Cancer Care hospital who has offered us cancer detection and treatment options to deserving patients.

SAY NO TO SUGAR AND JUNK FOODS: Sugar is the new tobacco, these days. Oral cavity is a reflection of your overall health. We humans have a sweet tooth and sugars and confectionery are the primary causes for many health problems starting from dental plaque to obesity . As a dentist we come across many patients with many health issues caused by sugar which include systemic diseases. Let us also take time to educate our patients against excessive intake of sugar.

Proposed IDA Pension Plan…….

In association with LIC, we are trying to work on a non employer -- employee pension scheme for all our members. The modalities are under negotiation and further good news on its implementation is awaited.

CDE: Programs conducted by state brach and local branch go a long way in enriching our knowledge and keep abreast with the latest developments in dentistry... We propose to conduct best possible state CDE programs and shall render all support to the local branches.

This year we have decided to focus on trauma care with an emphasis on dental aspects.

CE Act.

The lack of a representative from the Dental Sector in the District Registering Authority was accepted as a descrepancy by the Kerala government and a nominee from Dentistry would be included in every District council meeting as permanent invitee who will be taking care of the issues related to Dental sector.

IDA state office also intends to politely yet firmly pursue the interests of its members with the government and regulatory authorities like PCB, Local bodies, Health department (panchayath/ municipality / labour etc) to implement "ease of business", reduced paperwork and rationalize the fees levied for relevant licensings for the majority of members who are in private practice and running private dental care establishments.

I wish to congratulate all the newly elected state office bearers and branch office bearers.

A special thanks to IDA Malabar for moulding me to serve you in a better way. If it was not for the guidance and support of my home branch and its members, I wouldn't have been in a position to carry this responsibility and so may I take this opportunity to express my sincere gratitude and love for all my dear friends in IDA Malabar.

I look forward to working with the newly elected secretary of Ida Kerala state .....along with and a highly enthusiastic and talented EC team and take IDA kerala state forward on a path to progress and betterment of our association.

I know that, even Cent percent of my individual efforts will be nothing, compared to just a 10% of collective effort of our team including all the local branch office bearers and members.

So let's all work together and make this a great year ahead for IDA Kerala state.

With warm regards and best wishes..

Jai hind

Jai IDA Jai Hind, Jai IDA

Dr. CC Joseph
President, IDA Kerala state

Message from the Secretary

Dr. Deebu Jacob Mathew

Dear Members,

WISHING ONE AND ALL A VERY HEALTHY, HAPPY AND PROSPEROUS 2020!!

First and foremost, I extend my sincere gratitude to all of you for putting your trust in me and electing me to the post of Secretary of IDA Kerala State branch. Our dental fraternity has been facing numerous challenges and I assure you that I will work to the best of my abilities to bring about a positive and favourable outcome.

Currently, we are facing a global emergency in the form of COVID-19 which is causing a lot of apprehension. To contain the outbreak, the government has called for a lockdown. The only way to combat this situation is to go by the protocols set forth by the association and the government .

We are in the high risk category because of the nature of our profession. Our association has been in continuous communication with the authorities to bring to the members updates and to keep them informed about new developments.

A challenge faced by us is in terms of the newly introduced National Dental Commission Bill and the impending CE Act. We are all aware that if it is implemented, it will have serious repercussions on our practice. Slowly and steadily, we have been moving forward with a positive outlook to resolve these issue and we are hopeful ofpositive results. This has all been possible with your support and I trust that it will continue to be the same.

We also wish to stress on the importance of a safe and ethical practice that should not be overlooked by any member. This can be brought about by the maintainance of proper records in clinics, using of consent forms,implementation of standard treatment and infection control protocols and also by continuous updation of our professional knowledge so that we can provide the best possible dental care to our patients and ultimately, our community.

The IDA Kerala State has established innovative projects like IDA HOPE, IDA MARK, IDA CAN and the clinic management software IDA ASSIST. I request all our members to make use of and to promote these ventures .

Our association with its 37 branches is a typical example of unity in diversity, functioning as a single family and there lies our success. So together, let us be structured enough for success and achievement and flexible enough for creativity.

Thanking everyone once again for your support and co-operation and expecting the same enthusiasm and unity for the coming years as well.

STAY SAFE!!

Dr. Deebu Jacob Mathew
Secretary, IDA Kerala State

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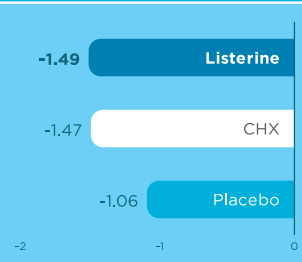

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Mesio-distal widths of mandibular permanent first molars and incisors as predictors of mandibular permanent canine and premolar widths (Melgaco method): applicability and reliability in north Kerala population

*Aravinthan Muthu, **Gopi Krishnan S., ***Jithesh Kumar, ***Suresh Babu C.

Abstract

Aim: The aim of this study was to test the applicability and reliability of the mesio-distal widths of mandibular permanent first molars and incisors as predictors of mandibular permanent canine and premolar widths (Melgaco method) in North Kerala population.

Methods: The sample consisted of 100 orthodontic study models, obtained from North Kerala population (62 females,38 males). The mesiodistal widths of the teeth were measured with digital Vernier caliper. Paired student t tests with significance level of 5% was used to compare the actual and predicted values.

Results: No statistically significant differences were found between the predicted and actual values of the sum of the mandibular permanent canine and premolar widths when using the new method (Melgaco method). The differences were 0.3mm for the male sample, 0.5mm for the female sample and the standard deviations were 2.2,2.3 mm respectively. The difference were -0.1 and -0.2 mm (male and female) in the Moyers method. However, overestimated predicted values with differences of 1 and 1.1mm (male and female) in the Tanaka and Johnston method were found.

Conclusions: The Melgaco method and Moyers method is consistent and applicable to the North Kerala population. Tanaka and Johnston methods tends to overestimate the actual values of the permanent canines and premolars.

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► Introduction

Most malocclusions involve problems of an imbalance between the size of the teeth and the size of the arches with which they are associated.[1] This is especially seen in the lower arch, which is constrained by the upper arch and can be seen clinically in class malocclusion with crowding. Most of these cases have less than three mm of negative tooth size arch length discrepancy.[2]

Tooth size prediction methods can be grouped into 3 categories: those that use linear regression equations (e.g., tables of prediction), those based on radiographs and those are combination of both. The first method is the most widely used, especially the tables of Moyers[3] and the equations of Tanaka and Johnston[4]. However, these equation and tables can either overestimate or underestimate the actual widths of the permanent canines and premolars. Estimating the mesio-distal widths of the mandibular permanent canines and premolars is an essential aspect of mixed dentition analysis.[5]

Method introduced by Tanaka-Johnston and Moyers overestimate the values in some populations. Hence, Melgaco came up with the idea of estimating the Mesio-distal width of mandibular permanent first molars and incisors as predictors of mandibular permanent canine and premolar widths and this will be added to the regression equation. (Melgaco method)

Regression equation for male is Y = X (0.975) and for Females is Y = X (0.971), where

Y= Sum of mesio-distal width of canine and premolars &

X= Sum of mesio-distal width of 1st molar and all incisors.

*Senior Resident, **Professor and Head, ***Professor, Department of Orthodontics, Mahe Institute of Dental Science and Hospital, Mahe, Pondicherry.
Corresponding author: Dr. Aravinthan M. Email: aravinthan310@gmail.com

The derived value will be estimated as the mesio-distal widths of permanent canine and the premolars.[6] The purpose of this study was to test the applicability and reliability of this method in North Kerala population by recording the mesio-distal widths of mandibular permanent first molars and incisors as predictors of mandibular permanent canines and premolars widths.

► Materials and Methods:

The study has been carried on dental casts of patients who reported for orthodontic treatment to the Department of Orthodontics and Dentofacial Orthopedics. The sample consisted of 100 dental casts of patients with permanent dentition in both arches except 3rd molar. Only samples from the North Kerala population has been included in the study so as to test the acceptability and reliability of mandibular permanent first molars and incisors as predictors of mandibular permanent canine and premolar width bilaterally in this population.

This study was carried out only in the mandibular arch because the arch length is generally diminished more in the mandibular arch during the transition from mixed to the permanent dentition.[7]

Inclusion criteria:

1) Patients with permanent dentition in both arches.

2) Patients with full complement of teeth in the Upper and Lower arch except the 3rd molars.

Exclusion criteria:

1) Interproximal caries or restoration
2) Missing or supernumerary teeth
3) Significant teeth wear
4) History of previous orthodontic treatment

For each patient cast, the sum of the following has been calculated:

1) Mesio-distal widths of four mandibular incisors and 1st molar (bilateral)

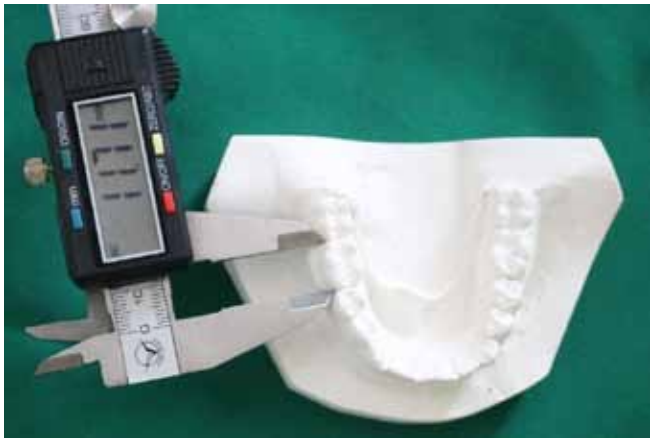

Figure 1. Measuring mesiodistal width using digital calipers.

2) Mesio-distal widths of mandibular canines and premolars in each quadrant.

A single investigator measured the casts with digital calipers. To determine the intra-observer reliability, casts was randomly selected and remeasured after 2 weeks. The actual values were compared with those predicted by the charts of Moyers, the method proposed by Tanaka and Johnston and Melgaco. Paired Student t tests with significance level of 5% was used to compare the differences between the actual and predicted sums of the mesio distal widths of the permanent canines and premolars.

► Results

The data was collected, tabulated and statistical analysis was done. The descriptive statistics include the predicted, actual mean difference and standard deviation. Correlation test is performed to assess the intra observer reliability. Paired Student t-test was done to test the acceptability of all the 3 methods. The correlation coefficient values were 0.998 for intra observer measurements, showing the consistency of the measurements. Given Table I, II, III.

The actual values when compared with those predicted by the methods of Moyers and Melgaco showed no significant difference in the result. The difference for Moyers was-0.1 mm for male subjects and -0.2mm for female subjects, while for Melgaco it was 0.5mm for male subjects and 0.3 mm for female subjects. There was significant difference in the Tanaka and Johnston method. Tanaka and Johnston method tended to overestimate the sums of the mesiodistal widths of the permanent canines and premolars by 1.0mm (male) and 1.1mm (female).

► Discussion

The leeway space is the difference between the mesiodistal diameter of the canines and the deciduous molars and their respective successors. Nance found that, on an average, there is a positive difference in favor of the deciduous teeth. This excess of space, when diagnosed in the mixed dentition and when adequately managed, allows simple treatment for crowding in the anterior region of the arch. Mesiodistal width of a tooth is the most fundamental aspect of tooth morphology with regard to arch length tooth size compatibility. Identification of tooth size arch length discrepancy by space analysis in the mixed dentition helps in the early diagnosis of conditions affecting the normal development of dental occlusion which can contribute to the significant reduction of malocclusions. Space analysis is developed to quantify the possible disparity between tooth size and arch length.[8]

The method which measures tooth width from dental casts were comfortable and caused no radiation to the patient. The most commonly used method in dentistry to measure the unerupted canine and premolars is the Moyers and Tanaka & Johnston method. But the drawback of these methods is that they were initiated in the North American population and Europe. Lavelle[9], Mayhill[10] & Al-Khandra[11] demonstrated tooth size variations in different racial groups.

Merz [12] showed the mean mesiodistal diameter of the black population's lower canines, bicuspids and first molars were significantly larger than that of the white sample. Thus, racial and secular trend variations exist in tooth sizes and proper testing should be required regarding the applicability of any prediction equation and charts based on one population to be used on another. When Moyers and Tanaka & Johnston methods were applied in other population they tend to underestimate or overestimate the unerupted canine and premolars. Chaiwat[13] in the Thai population, Al-Bitar[11] in Jordan population& Schirmer[14] in black South African population found that the Moyers method tend to underestimate the unerupted canines and premolars. In this present study, the Moyers values were underestimating by mean of -0.1 mm in male & -0.02 mm in female samples. This same result was found by Khandy[15] in the Gujarati population, Dhanu[16] in Karnataka population&

Table 1. Actual and predicted SCPM, Mean difference, and standard deviations with the method of Melgaco

	Predicted values (mm)		Actual values (mm)		Difference (mm)		
	SCPM		SCPM		Predicted-	Actual values	Significance
	Mean	SD	Mean	SD	Mean	SD	P value
Female (n=62)	42.4	2.2	41.9	2.3	0.5	2.2	0.25
Male (n=38)	43.6	2.2	43.3	2.4	0.3	2.3	0.51

Statistical significance (P<0.05)

SCPM: Sum of the mandibular canines and premolars.

Table II. Male patients: Actual and predicted values of SCPM based on the methods of Moyers and Tanaka and Johnston method (sample size =38)

	Predicted values (mm)		Actual values (mm)		Difference (mm)		
	SCPM		SCPM		Predicted	Actual	Significance
	Mean	SD	Mean	SD	Mean	SD	P value
Moyers 75% (both sides)	43.2	1.3	43.3	2.4	-0.1	1.7	0.78
Tanaka and Johnston (both sides)	42.4	1.5	43.3	2.4	1.0	2.1	0.00

SCPM: Sum of the mandibular canines and premolars of both sides

*significant; level of significance P <0.05.

Table III. Female patients: Actual and predicted values of SCPM based on the methods of Moyers and Tanaka and Johnston method (sample size = 62)

	Predicted values (mm)		Actual values (mm)		Difference (mm)		
	SCPM		SCPM		Predicted	Actual	Significance
	Mean	SD	Mean	SD	Mean	SD	P value
Moyers 75% (both sides)	41.7	1.4	41.9	2.3	-0.2	1.9	0.61
Tanaka and Johnston (both sides)	43.0	1.7	41.9	2.3	1.1	2.0	0.00

SCPM: Sum of the mandibular canines and premolars of both sides

*significant; level of significance P <0.05.

Bharatnagar[17] in UP population when the study was conducted in different Indian states.

The Tanaka & Johnston method overestimated the canine and premolars in this present study by mean of 1 & 1.1 mm for males and females. Same identical results were found by Brito[6] in Brazil population, Al-Khandra1[8] in the Saudi population, Kommineni[19] in Tamil Nadu and Dasgupta[20] in West Bengal population.

To overcome this, Melgaco[5] came up with the idea of measuring the mesiodistal widths of mandibular permanent first molars and incisors as predictors of mandibular permanent canine and premolar widths. His result showed no statistically significant differences when comparing actual and predicted values. He found out that this method had high correlation r = 0.81 and r2 = 0.65. When this Melgaco method was applied in other population the positive results were obtained by Rasool[21] in Pakistan, Bernabe[22] in Peruand Mittal[23] in Rajasthan. Hence, the same method was followed in this study and found that this method was applicable and reliable in the north Kerala population.

In this present study, Melgaco method had no statistically significant difference ($p > 0.05$) when compared with actual and predicted values. In male samples, the mean difference of the estimated sum of the mesiodistal widths of the permanent canines and premolars were 0.3 mm. In female samples, the mean difference of the estimated sum of the mesiodistal widths of the permanent canines and premolars were 0.5 mm. Even though Melgaco method tend to overestimate the predicted mesiodistal width by 0.3& 0.5mm it is the most accurate when compared to the other two methods.

► Conclusion

When comparing these three methods the Moyers and the Melgaco method are more reliable. Melgaco and Moyers method are applicable in North Kerala population, while the Tanaka and Johnston method are not applicable in this present population. Hence, Melgaco method of estimating the Mesio-distal widths of mandibular permanent first molars and incisors as predictors of the mandibular permanent canine and premolar widths is consistent and reliable in this present population.

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Comparison of basal and crestal implants in the rehabilitation of atrophied mandibular ridges: a review

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Abstract

Introduction: Prosthetic rehabilitation of atrophied edentulous jaws by placing implants is a challenging procedure. Crestal and basal implants are endosseous aids for fixed or removable dentures. To overcome unfavorable anatomical and mechanical conditions calvarial or iliac bone grafts, sinus lift procedures, or mental nerve displacement procedure are often used. An alternative are basal implants,that can be placed in very little vertical bone as it engages cortical bone for implant retention

Objectives: Aim is to determine whether basal implants can be superior to crestal implants in atrophied mandibular ridge and to evaluate with regard to implant primary stability, osseointegration, survival rate and post - operative complications.

Material & methods: Electronic search was performed to obtain articles between 1998 and 2018 and 34 article selected based on guide lines

Results: From the studies primary stability of crestal and basal implants were 100%, osseointegration were 98% and 100%, survival rate of crestal implants were 93% and 100% for basal implants,and postoperative complications in crestal implants were 17.39% and basal implants were 45%.

Conclusion: According to the studies in atrophied mandibular ridge, primary stability and osseointegration were more or less similar for both implants, but the post- operative complications are higher in basal implants and make it inferior to crestal implants.

Key words: Atrophied mandible; Basal implants; Crestal Implants; Osseo integration.

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► Introduction

Prosthetic rehabilitation of edentulous ridges was very important for the functional and esthetic need of patients. Since the discovery of endosseous dental implants, they have been widely used to support different types of dental prosthesis such as removable and fixed complete dentures and fixed partial dentures. A severely resorbed mandible poses a true challenge to the clinician while fabricating complete dentures. Tooth extraction is followed by a loss of bone width by 25% and a loss in bone height of 4 mm during the first year.[1] Implantation becomes more challenging in a poor quality and quantity of bone. In practical clinical terms the smallest Branemark implant requires minimal bone volume of 8 mm in height and 6 mm in width. But in many patients the minimal bone requirement is lacking due to a resorbed alveolar ridge or close proximity of anatomic structures like mandibular nerve, mental foramen, maxillary sinus, nasal cavity, incisive canal etc. To overcome, such initially unfavorable anatomical and mechanical conditions calvarial or iliac bone grafts, sinus lift procedures, or mental nerve displacement procedure are often used. Though this gives acceptable success rates, the donor and recipient sites can show an unpredictable degree of morbidity. Further, some patients are often reluctant to undergo such extensive surgical procedures. An alternative are basal implants,that can be placed in very little vertical bone as it engages cortical bone for implant retention. The basal or cortical bone which is highly dense, less prone to infection and resorption, it also have high load bearing capacity compared to crestal bone. Single piece basal implants were developed in 1972 by Jean-Marc Julliet and in 1980s Gerard Sorctecci developed a basal implant system which is easier to use with appropriate cutting tools. The so-called disk implants or lateral basal implants which were in round shape with roughened surface were developed in 1997 by Stefan Ihde,who continued to improve them with a

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base plate design and fracture proofing. Current basal implants also include bending zones in the vertical implant shaft and a screwable design.

Crestal and basal implants are both endosseous aids which engage bone by creating osseointegrated points of retention for removable or fixed dentures. But there is much difference between both, in their structure, the way they are inserted, and the pattern of load distribution. Crestal implants are inserted vertically from top of alveolar crest into jaw bone, and the pattern of force transmitted and the load transmitting surfaces are vertical, whereas basal implants are inserted in to jaw bone laterally and so they are called as lateral implants or disk implants. For these reasons the indications, treatment plan, execution and post insertion treatment regime of both implants differ.

Objective of this article is to compare the performance of basal implants to crestal implants in an atrophied mandibular ridge based on primary implant stability, osseointegration, implant survival, and post-operative complications.

► Material and Methods

This review was designed to study the various therapeutic aspects for restoring atrophied mandibular ridge with the different types of implant design available.

Eligibility criteria: Following criteria's where followed while searching for the research material for this particular study.

Inclusion criteria:

1. Articles in English were selected

2. Articles published between 1998 and 2018.

3. The studies which give information regarding osseointegration, implant stability, survival rate and post-operative complications to cases already treated by crestal or basal dental implants in atrophied mandibular ridges.

4. The studies which provide information of patients in either sex, with age more than 16 and less than 75 years.

5. The included studies were review article, prospective studies and case reports.

Exclusion criteria:

1. In vitro studies.

2. Studies in relation to promotion of implant brand

3. Studies with information of patients above 75 years of age.

4. Studies without an English abstract and studies in other than English language

Information Sources:

A literature search was performed in the database, Pubmed as well as Google scholar and hand searches. The search terms used in search of relevant articles and materials were Dental implants, Basal implants, Lateral implants, Disk implants and resorbed /atrophied mandible.

Total number of articles obtained where 145 and finally 20 number of articles where selected related to crestal and basal implants according to the criteria below.

Data collection:

PICO criteria followed for deriving the data from the articles:

P – Participants: patients treated with crestal and basal osseointegrated dental implants.

I – Intervention: Crestal and basal osseointegrated implant placement.

C – Comparison: Crestal and basal dental implants placed.

O – Outcomes: Primary stability, osseointegration, post-operative complications and success rate of implants with bone.

S – Study designs: clinical evaluation

► Results

Basal implants: The basal implants are those implants which use the principles of utilizing basal cortical bone areas of jaw for the implant retention.

There are two types of basal implants: Basal osseointegrated implants (BOI) and Basal cortical screws (BCS).

Indications

1. All kinds of situations when several teeth are missing or have to be extracted.

2. When the procedure of 2-stage implant placement or bone augmentation has failed.

3. Untreated periodontal disease (especially in diabetics) and in all kinds of bone atrophy.

4. Trauma to jaw which damages not only the teeth but also the alveolar bone.

Contraindications:

1. Medical conditions: There are a number of medical conditions that preclude the placement of dental implants. Some of these conditions include: Recent myocardial infarction (heart attack) or cerebrovascular accident (stroke), Immunosuppression (a reduction in the efficacy of the immune system).

2. Medicines: Drugs of concern are those utilized in the treatment of cancer, drugs that inhibit blood clotting and bisphosphonates (a class of drugs used in the treatment of osteoporosis).

3. Poorly controlled diabetic patients are contraindicated as it can impair wound healing and can predispose to infection.

4. Psychological and mental conditions like psychiatric syndromes (eg. Schizophrenia), mental instability (eg. neurotic, hysteric), mentally uncooperative), irritational fears; phobias, unrealistic expectations.

5. Habits and behavioral considerations- Smoking, parafunctional habits (Bruxism), substance abuse (eg. alcohol, drugs).

Crestal implants

Crestal implants also called endosseous implants, and are implants inserted through the alveolar bone in situations where adequate vertical bone content is present. The main load transmitting surfaces are vertical.

Implant types: Root form implant are type of endosteal implants designed to use vertical column of bone, as similar to the root of natural tooth. Even though many names have been applied, the 1988 National institute of Health consensus statement on dental implants and the American academy of implant dentistry recognized the term root form. According to implant body designs the three categories are

Cylinder implants- They are press-fit root form implant with a coating or surface condition to give microscopic retention to the bone. Often the surface is either have a macro retentive design (eg. Sintered balls) or coated with a rough material (eg. Hydroxyapatite, Titanium plasma spray). It can be a tapered implant design or parallel wall cylinder.

Screw design implants,-They have macroscopic retentive elements of a thread for initial bone fixation and are threaded into a slightly smaller prepared bone site.

Indications:

1. Edentulous patients- The patients who seem to benefit from dental implants are those with fully edentulous arches. These patients can be effectively restored, both esthetically and functionally, with an implant supported removable or a fixed prosthesis.

2. Partially edentulous patients- Multiple missing teeth can be restored with implants. The major advantage is restoration can be done without invasion or alteration of adjacent teeth.

Contraindications: Same as that of basal implants

Primary stability

It is the initial mechanical engagement of implant with the surrounding bone and is measured by Resonance Frequency Analysis (RFA) and it is the measurement of frequency with which a device vibrates. In the device a sensor is mounted on

Table I: Crestal implant - Primary stability (PS) and osseointegration

Author/ year	Study type	Implant type	period	Procedure	Site	Loading time	Supra structure	P S Yes/NO	Osseointegration Yes/NO
Visser, A al 2005 [2]	Prospective study	IMZ implants	5 years	Two stage	Mandible	2 months	Over denture	present	Present except 1 implant
Francetti L et al 2008[3]	prospective study	Nobel Bio care	5 years	Single stage	Mandible	Loading Within 48 hours	Fixed bridge	Present	Present
Shukla V et al 2015[4]	Case report	Endosteal-implant, Osstem GS	6 months	Two stage	Mandible right posterior region	6 months postoperatively	PFM bridge	present	Present
Durrani F , 2015[5]	Case report	Uniti, Equinox implants		Two stage	Mandible A,B,D,E positions	3 months	Bar and clip over denture	present	Present

top of the implant and the sensor is brought to vibration by gently moving it with magnetic pulses. Sensor will vibrate for a short time and then stops. If the implant stability, which is the stiffness of bone –implant interface increase, vibration frequency of sensor also increases. The unit of measuring primary stability is implant stability quotient (ISQ). The ISQ scale range from 1-100.

Osseointegration

Branemark in 1965, introduced the term osseointegration to describe the successful union of bone to implant integration. For a successful osseointegration, many factors are involved, and it is the absence of implant mobility in axial, lateral and rotational direction in the implant bed. Implant survival rate is that the number of implants in place over the number of dental implants that were placed.

Post-operative complications

They are the sequel of complication that occur mainly due to poor patient selection. A distinction should be made the term accident and complication. The events that occur during surgery are accidents and events appear postoperatively are complications, which is divided into as early stage complications and late stage complications.

The initial data base search yielded 145 studies and among this 20 studies were finally selected with screening on basis of inclusion and exclusion criteria. The included studies were case reports, prospective studies and review articles between the years 1998-2018. In the case reports implants of various systems were used. Table I and II shows primary stability and osseointegration of crestal and basal implants whereas table

Table II: Basal implant - Primary stability and osseointegration

Author/ year	Study type	Implant type	No: patients/ implants	period	Procedure	Site	Loading time	Supra structure	P S Yes/ NO	Osse-ointe-gration Yes/NO
Ihde S et al 2004[6]	Case report	BOI EDADS 9/14G7 7G5 EDDS	¼	3 months	Without bone augmentation	Mandible	Immedi-ate	Acrylic mounted on chrome cobalt bridge	Pre-sent	present
Garg, R,et al 2017[7]	Pro-spective study	Basal implants	4/52	36 months	Single stage BOI	Mandible	Imme-diate loading	Fixed bridges	pre-sent	present
Gupta, A, et al 2017 [8]	Case report	BCS KOC	1/10	4-6 months	Without bone augmentation	Mandible	Imme-diate loading	Cement retained hybrid dentures	pre-sent	present
Mahender S, et al 2017[9]	Case report	BCS sin-gle piece implant	1/1	6 months	Removal of root with hemisection and immedi-ate implant placement.	Mandibl 36 distal root	3 days post opera-tively	PFM crown	pre-sent	present
Daniel TS , et al 2017[10]	Case report	KOS BCS	10/56	1 year	Flapless procedure	Mandible	Imme-diate loading	PFM crown	pre-sent	present
Vivek, G. 2018[11]	Case report	Single piece implant BECES MU implant	1/8	6 months	Flapless procedure	Mandible	Imme-diate loading	Metal fused ceramic screw retained bridge	pre-sent	present

III and IV survival rate and post-operative complication of crestal and basal implants

► Discussion

The intention of this study was to compare the performance of basal implants to crestal implants in atrophied mandibular ridge based on primary stability, osseointegration, post-operative complication and survival rate. When treating a resorbed mandibular ridge, selecting a particular type of implant was difficult. A good alternative to crestal implant was basal implants in above conditions. Crestal and basal implants differed in various aspects in its structure, surgical procedures, load transmission, loading time etc. The study is meant to have a clinical evaluation found to be necessary to choose a better option. The most important clinical goal to be achieved while placing implant is its primary stability and it determines the time of implant loading. Implant success also depends on endogenous factor like bone quality and exogenous factor like implant design. Bone quality differs in different areas of anatomy in upper and lower jaw. Mandible is more densely corticated, and harder than maxilla. The basal implants used in the case reports were BOI, EDADS, DISKOS-IDBrand, BCS and KOS implant. The surgical procedure used were flapless and early loading were done in all cases. The super structure were, PFM crowns, cement retained hybrid dentures. In all cases primary stability and osseointegration were present. Advantages of basal implants are no bone augmentation procedure needed, immediate prosthetic loading is achievable. The post-operative complication found in crestal implants were reported in the review article of Taylor 1998 which described implant failure, prosthetic misfit, component fracture and screw loosening.[12] Goodacre, CJ. gave surgical and mechanical complication.[13] Wismeijer D 1999 in his article details about loss of implant of

Table III: Crestal Implants - Survival rate and post-operative complication

Author/ Year	Study design	Survival Rate	Post-operative complications	Type of complication
Taylor J 1998[12]	Review article		Present	Implant failure, prosthesis mis-fit, component fracture and screw loosening
Goodacre CJ. et al 1999[13]	Review article		Present	Surgical complication, Mechanical complication
Wismeijer D et al 1999[14]	RCT	98%	Present	Out of 283 ITP implants only 6 implants lost
Visser,A. et al 2005[2]	5 year Prospective study		Absent	Out of 180 implants, 1 lost
Liaw K et al2015[15]	Review article		Present	Bio mechanical overload, infection and etetinflammation,
Durranil F2015[5]	Case –report	100%	Absent	
Francetti,L et al 2008[3]	prospective study	100%	Absent	

Table IV: Basal implants - Survival rate and post-operative complication

Author/ Year	Study Design	Survival rate	Post-operative complications	Type of complication
Ihde, S, 2009[16]	Review article		Present	Overload osteolysis leading to mobility of implants, pain and infection
Nair, C. et al 2013[17]	Review article		Present	Implant mobility, infection and pain
Shukla, V. 2015[4]	Case report		Present	Acute Pain ,fracture of basal implants especially discoid implants leave a large size bone defect after retrieval of failed implant
Jain,M.et al 2017[18]	Review article		Present	Extensive exposure of surgical site, post-operative pain and swelling
Ritesh ,G. et al 2017[7]	Prospective study		Present	Intraoperative pain and time more, primary stability difficult to achieve, post-operative pain is severe
Sohaib, S. et al 2018[19]	Review article		Present	Infection, functional overload osteolysis

6 implants out of 283 ITP implants.[14] Other two articles Anita, V. 2005 and Liaw, K 2015 showed minor post complications like inflammation and one implant loss out of 180 implants.[2,15] The articles related to basal implants were more review articles and few case reports. The main complication mentioned by authors were overload osteolysis leading to loss of implant, pain, infection and inflammation. Mansi, J. 2017, in her article mentioned about severe post-operative pain, swelling and extensive exposure of surgical site.[18] The failure of basal implant, on its retrieval leaves a large size bone defect according to Shukla, V 2015.[4] Post-operative complication of basal implant according to articles are very much higher than the crestal implant. Percentage of post-operative complications for basal implants were 45% whereas, crestal implants had only 17.3%

► Conclusion

Comparing crestal and basal implants, there are much difference in both of its structure, indication and in surgical placement. Commonly used implant all over the world is crestal implant due to its popularity and high success rate, even though basal implant leave an added advantage in poor bone quality ridge as it utilizes the cortical bone for retention and could be placed without bone augmentation. The limited literatures present on the basal implants and its suspected high complications make crestal implants more favorable than basal implants.

Limitation of the study

The inadequate research with regard to basal implants is a major limitation of the study as many reported articles were not in English language and could not be included.

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Nitrous oxide inhalation sedation – a boon to pediatric dentistry

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Abstract

Performing quality dental treatment on pediatric patient can often be challenging, due to behavioural problems. Depending on patient emotional maturity and their physical, psychological and mental skills, the usual non pharmacological mean of behavioural management may not be effective. In these circumstances, more invasive methods of behavioural management such as conscious sedation and general anaesthesia may become necessary. Of the various method available, Nitrous oxide sedation has shown to be an effective anxiolytic and sedative inhalation agent. This article reviews the efficacy and safety of Nitrous Oxide Inhalation Sedation (NOIS) and also throws light on the current scenario of NOIS in Kerala.

Keywords: Pediatric patient, behavioural problems, Nitrous Oxide inhalation sedation

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► Introduction

Most children during dental treatment are relaxed and relatively co-operative, but some display unwanted tantrums. Managing a child's behaviour during dental procedure is an important factor in delivering safe and effective dental care for a paediatric dentist. This can be achieved by the effective and efficient use of various non-pharmacological behaviour management techniques. Unfortunately, not all children in Paediatric practice can be managed by these techniques alone, pharmacological techniques of behaviour management such as sedation and anaesthesia are considered as a valuable tool by practitioners in such children.[2]

Inhalation sedation is a popular form of sedation. One of the time tested and safest methods among this is nitrous oxide inhalation sedation (NOIS) which is used by dental professionals worldwide. Despite being safe, efficient and patient-friendly nitrous oxide is not put to its potential use in Kerala.

Nitrous oxide is sweet-smelling, colourless, non-inflammable inert gas and is compressed in the cylinder at 750psi as a liquid that vaporises on release. It is an effective analgesic/ anxiolytic agent causing central nervous system depression and euphoria with little effect on the respiratory system.[3, 4]

Mechanism of action

The analgesic effect of nitrous oxide appears to be initiated by neuronal release of endogenous opioid peptides with subsequent activation of opioid receptors and descending Gamma-Amino Butyric Acid type A (GABAA) receptors and noradrenergic pathways that modulate nociceptive processing at the spinal level. The anxiolytic effect involves activation of the GABAA receptor either directly or indirectly through the benzodiazepine binding site.[5]

On inhalation, nitrous oxide is quickly absorbed from the alveoli in the lungs and is held in a simple solution in the serum. Following administration, N_2O will become saturated in blood within 3-5 minutes and the alveolar concentration rapidly approaches the inspired concentration. From the alveoli it enters low pressure capillaries and then the brain where it causes anxiolytic and analgesic effect. The patient remains conscious and cooperative with protective reflexes fully maintained, also experiences a pleasant, floating and detached sensation.[6]

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Indications for use of nitrous oxide-oxygen analgesia/ anxiolysis include[7]:

1. A fearful, anxious patient.
2. Certain patients with special health care needs.
3. A patient whose pharyngeal reflex interferes with dental care.
4. A patient for whom profound local anesthesia can't be obtained.
5. A cooperative child undergoing a lengthy dental procedure.

Contraindications for use of nitrous oxide- oxygen inhalation include:

1. Some chronic obstructive pulmonary diseases.
2. Severe emotional disturbances or drug-related dependencies.
3. First trimester of pregnancy.
4. Treatment with bleomycin sulphate.
5. Methylenetetrahydrofolate reductase deficiency.
6. Cobalamin deficiency.

A review of the patient's medical history should be performed before the choice to use nitrous oxide/oxygen analgesia/ anxiolysis. This assessment should include allergies and previous allergic or adverse drug re- actions, current medications, previous hospitalization and recent illnesses (eg, cold or congestion) that may compromise the airway.

Administration Techniques of $N_2O – O_2$ Inhalation Sedation

The practitioner administering the anxiolytic agents must be trained in the use of such agents and should be competent enough to handle any emergency response. Nitrous can be induced in two techniques:

Slow induction technique:

The appropriate sized nasal hood is placed over the nose. The reservoir bag is filled with 100% oxygen and is administered at a flow rate of 5-6 L/min for 2-3 minutes. Encourage the patient to breathe through the nose. The bag should pulsate with each breathe and should not be either over or underinflated. N_2O is introduced in increments at a concentration of 5-10% for every 3 minutes. Adjust the concentration to 30% nitrous oxide and 70% oxygen. Nitrous oxide concentration could also be decreased during easier procedures (eg, restorations) and increased during more stimulating ones (eg, extraction, injection of local anesthetic). Side effects such as nausea and vomiting are more likely to be observed when titration is not employed[8]. The effects of nitrous oxide largely are dependent on psychological reassurance so traditional behaviour guidance techniques should be continued during treatment. Once the nitrous oxide flow is terminated, 100 percent oxygen should be delivered for five minutes[9]. The patient must return to pre-treatment responsiveness before discharge[5].

Rapid Induction Technique

In young children who are extremely apprehensive and continuously crying, higher concentrations of N_2O > 50% are administered initially. Once the child regains his composure and settles down the concentration of nitrous oxide is reduced to 30% and the same concentration is maintained throughout the procedure.

Rapid induction by the premix of 50% N_2O – 50% O_2 is well documented in the literature with minimal complications and greater efficacy of producing anxiolysis and analgesia during the procedure[9].

Monitoring

Visual monitoring of the patient's respiratory rate and level of consciousness has to be carried out throughout the treatment. Spoken responses provide indicate that the patient is breathing[10]. If any other pharmacological agent is used in addition to local anaesthesia, monitoring guidelines for the appropriate level of sedation must be followed[11].

Adverse effects of nitrous oxide – oxygen inhalation. Nausea and vomiting are the most common adverse effects occurring in 0.5% of patients[12]. A higher incidence is noted with longer administration of nitrous oxide/oxygen, fluctuations in nitrous oxide levels and increased concentration of nitrous oxide[13]. Diffusion hypoxia occur as a result of the rapid release of nitrous oxide from the blood stream into the alveoli, thereby diluting the concentration of oxygen. This may lead to headaches and disorientation and can be avoided by administering 100% oxygen after nitrous oxide has been discontinued[13].

Safety on nitrous oxide – oxygen inhalation

Nitrous oxide is a safe and effective agent for providing pharmacological guidance of behaviour in children when it is administered by trained personnel on carefully selected patients with appropriate equipment and technique. Acute and chronic adverse effects of nitrous oxide are rare[14].

An over sedated child can be brought back to minimal sedation by decreasing the concentration of N_2O by 5-10%. Nitrous oxide does not bind with haemoglobin resulting in its insolubility and very little absorption in the blood. On termination there is rapid diffusion of N_2O from the capillaries to the alveoli and then exhaled out. Any traces of nitrous oxide in the anatomic dead space can be washed out by administering 100% O_2.

Fasting is not required for patients undergoing sedation. The practitioner, however, may recommend that only a light

meal be consumed in the two hours prior to the administration of nitrous oxide[15]. To increase the comfort level during the procedure the child is advised to wear loosely fitting clothes.

Current Scenario of Nitrous Oxide – Oxygen Inhalation Sedation in Kerala

The use of sedation is going to be inevitable because of increasing demand from the parents and children for pain-free dentistry. But conscious sedation is always a controversial issue when it is considered outside an operation theatre and all the more performed by a non anesthesiologist[16]. The debate on this has been going on in our country.

Among all drugs and routes of sedation used in paediatric dentistry, Nitrous oxide – oxygen inhalation sedation has got an impeccable track record over 80 years with nil mortality[17]. The safety of NOIS lies in its exclusive use without combining it with any other drugs.

Lacunae in training and the anxiety about unforeseen medical emergencies that can arise prevent the practitioners from using NOIS in routine practice. The curriculum of undergraduate dentistry courses lacks the training needed for the management of emergency and/or urgency situations. This calls for efficient and effective training and possible experience under supervision to boost the confidence and capability of the practitioner to use NOIS.

► Conflicts of Interest

The authors declare no conflicts of interest

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Clinical and radiographic evaluation of root maturation in necrotic immature permanent teeth after the pulp revascularization procedure

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Introduction:

Dental trauma and caries constitutes two predominant causes for pulp necrosis in children, leading to arrest of further root development. An immature tooth refers to one with incomplete root formation. Endodontic treatment of immature permanent teeth remains a challenge to the dentist, owing to the presence of large open apices, divergent root canals, thin dentinal walls that are susceptible to fracture and frequent periapical infection[1]. The standard treatment protocol for the management of immature permanent teeth with necrotic pulps and apical periodontitis is apexification which involves long-term intracanal application of Calcium hydroxide ($Ca(OH)_2$). The introduction of apexification by the use of calcium hydroxide was pioneered by Heithersay[2] and Frank[3]. Andreasen et al[4] have shown that long term application of calcium hydroxide in the root canal can weaken the root structure and can render the tooth more susceptible to fracture; on lateral condensation or later after obturation even with minor impacts.

In order to overcome the disadvantages of calcium hydroxide apexification, one visit apexification using Mineral Trioxide Aggregate (MTA) had been introduced by Witherspoon and Ham[5]. The placement of an apical plug of MTA provides a scaffold for the formation of hard tissue and thus to achieve a better biological seal. However, it does not strengthen the remaining tooth structure or encourage continuation of the root growth. This emphasizes the need for a better and effective treatment protocol for the management of necrotic immature permanent teeth.

Recently, there has been a paradigm shift in the management of these teeth based on the "regenerative concept." Case series and reports have documented the efficacy of pulp revascularization. This involves intentional induction of bleeding from the peri-apex and formation of an intra-canal blood clot, which acts as a scaffold for the growth of stem cells. The pulp revascularization of nonvital immature teeth is based on the concept that vital stem cells in the apical papilla can survive pulpal necrosis, even in the presence of periapical infection, because the open apex provides good communication to the periapical tissues[6,7]. The rationale of revascularization is that if a sterile tissue matrix is provided in which new cells can grow and the coronal access effectively sealed, pulp vitality can be re-established[8].

Recent case reports from multiple investigators support the feasibility of developing biologically based regenerative endodontic procedures. It is important to develop a safe, effective, and consistent method for regenerating a functional pulp-dentin complex in our patients.[9]

However most of the literatures available regarding the revascularization procedure are case reports or case series. Statistically proven studies are very few in number. So, the this study was conducted to statistically analyze the success rate of revascularization procedure in necrotic immature permanent teeth. A prospective clinical study was conducted in the

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Department of Pediatric and Preventive Dentistry, Government Dental College, Kozhikode to evaluate the effectiveness of pulp revascularization procedure in necrotic immature permanent teeth by means of clinical and radiographic assessment.

► Aims and Objectives

The aim of this clinical study was to evaluate clinically and radiographically, the root maturation in necrotic immature permanent teeth after pulp revascularization procedure.

The objectives were:

1. To evaluate clinically, the periapical healing of necrotic immature permanent teeth after pulp revascularization procedure.

2. To evaluate radiographically,

a. The continuation of root development

b. Increase in lateral wall thickness of the root and narrowing of pulp canal space

c. Apical closure, and

d. Healing of periapical lesions of necrotic immature permanent teeth after pulp revascularization procedure.

► Materials and Methods

The present study was conducted in the Department of Pedodontics and Preventive Dentistry, Government Dental College, Kozhikode after obtaining approval of Human Ethics Committee, Medical College, Kozhikode. Cases were selected from the outpatient section of the department, based on clinical and radiographic criteria. The inclusion criteria set for this study were; Patients who were healthy and free of any systemic diseases, with necrotic/nonvital immature permanent teeth secondary to trauma or caries; preoperative radiograph showing incomplete root formation, wide apical foramen (apex >/= 1 mm), thin dentinal walls and teeth without periapical radiolucency or those with a periapical radiolucency of diameter </= 10mm. The exclusion criteria consisted of those who did not satisfy the inclusion criteria and also patients who were allergic to any drugs, grossly decayed or fractured teeth, presence of draining sinus and periodontal pockets and presence of external or internal tooth resorption.

The study group consisted of 29 healthy children 9 females and 20 males all between 7– 12 years comprising of 25 maxillary central incisors, two mandibular central incisors, one mandibular lateral incisor and one mandibular second premolar. The radiographs of three cases are shown, Case 1 with two maxillary incisors involved, Case 2 with three mandibular incisors involved and Case 3 with the left second mandibular premolar involved. 13 of the selected cases were with periapical involvement and the rest 16 were without.

Materials used included the surgical armamentarium, rubberdam isolation, airoter hand piece and sterile burs, irrigating solutions including 1.25% NaOCl, 0.12 % Chlorhexidine and distilled water, triple antibiotic paste consisting of metronidazole, minocycline and ciprofloxacin and also restorative materials including Intermediate restorative material (Caulk; Dentsply), White MTA (Proroot MTA; Dentsply Maillefer), Light Cured Glass Ionomer Cement (GC Gold Label), and composite resin.

The triple antibiotic paste was prepared by mixing powdered metronidazole, minocycline and ciprofloxacin taken in equal proportions, mixed with propylene glycol and macrogol ointment as per the instructions by Trope[1].

The patients and their parents were informed and educated about the procedure and the potential risks and written consents were taken from the parents. In the first visit, under local anesthesia and rubberdam isolation, access cavity was prepared and the root canal was copiously irrigated with 1.25% sodium hypochlorite (NaOCl), 0.12% chlorhexidine, and distilled water. Then the canal was dried with sterile paper points. The triple antibiotic paste prepared in a creamy consistency was placed inside the canal. The access cavity was closed with cotton pellets and intermediate restorative material. Any occlusal interference present was relieved. Patients were advised to take a course of systemic antibiotics and analgesics.

All patients were recalled after 1 week. In the second sitting, the tooth was checked for any discoloration, abscess, mobility, or pain on percussion. Under rubberdam isolation, and local anesthesia the tooth was re-accessed and the antibiotic paste was irrigated away using distilled water. No instrumentation of the canal space was performed. Canal space was dried using sterile paper points. The apical tissues beyond the confines of the root canal were stimulated with a sterile endodontic file to induce bleeding into the canal space. The bleeding was allowed to reach the level of cement enamel junction. In order to allow a blood clot to be formed, the canal was left untouched for a period of 15 minutes. White mineral trioxide aggregate (Proroot MTA; Dentsply Maillefer) was then prepared by mixing the powder with sterile water. It was then placed over the blood clot with the help of a plastic carrying instrument and an endodontic plugger. Once the initial setting of MTA was achieved, light cure GIC was placed over it and was cured. Then the access cavity was finally restored with composite restoration.

Assessment of Outcome

The patients were reviewed first after one month and thereafter every three months for a period of 15 months. In each recall visit, the improvement or deterioration of the cases were assessed clinically and radiographically. The clinical assessment

was carried out with regard to the presence or absence of discoloration, abscess, pain, pain on percussion and mobility. A scale was used for the assessment of pain, pain on percussion and mobility. Intraoral periapical radiographs were taken by paralleling technique for standardization according to the ADA guidelines[10]. Clinical findings were assessed qualitatively and radiographic findings quantitatively.

Radiographically the teeth were evaluated for the evidence of apical closure, reduction in periapical radiolucency, and presence or absence of lamina dura. Thickening of lateral root walls and narrowing of pulp canal space were evaluated in the 15th month recall visit.

An intraoral periapical radiograph was taken preoperatively for a baseline record to be compared with the follow up radiographs taken after 1 month, 3 months, 6 months, 9 months, 12 months and 15 months. The size of apical foramen, thickness of lateral walls of the root and width of the pulp canal space were measured using dial Vernier calipers having standard error of 0.02 mm, with the help of a magnifying lens. The progressive appearance of lamina dura was also noted and recorded as absent, discontinuous or continuous. The size of periapical radiolucency was measured by calculating the area using graph paper. Initially, from the radiograph the border of periapical radiolucency was traced to an acetate matte paper. The area was then measured by positioning the traced paper over 1 mm graph paper and counting the number of squares involved.

Scoring

The clinical and radiographic findings were noted as follows:

● Clinical Evaluation

1. Discoloration:

- Present = 1
- Absent = 0

2. Abscess: Any fluctuant tender swelling in the periapical region of the tooth in consideration was taken as an abscess.

- Present = 1
- Absent = 0

3. Pain

- Absence of pain = 0
- Mild = 1
- Moderate = 2
- Severe = 3

Pain was considered to be mild when there was slight pain without much discomfort; moderate when there was noticeable pain with tolerable discomfort and severe when there was intolerable pain.

4. Pain on Percussion (POP)

Pain on percussion was assessed, depending upon the degree of pain elicited on a light tap with the handle of a mouth mirror as follows:

- Absence of pain = 0
- Mild = 1
- Moderate = 2
- Severe = 3

5. Mobility

Mobility of involved teeth was assessed by using the blunt handles of two metal instruments and was scored as follows:

- Grade 0 = Normal physiological mobility
- Grade 1 = Labiolingual mobility
- Grade 2 = Labiolingual and mesiodistal mobility
- Grade 3 = Labiolingual, mesiodistal and vertical mobility

● Radiographic evaluation

1. Apical Foramen (AF)

- Width of apical foramen (mm) was measured from the radiographs preoperatively and also after 1 month, 3 months, 6 months, 9 months, 12 months and 15 months

(Apical foramen </= 0.5mm was considered as closed)

2. Periapical Radiolucency (PAR)

- In those cases with periapical radiolucency, the respective area was measured in mm2 preoperatively and also after 1 month, 3 months, 6 months, 9 months, 12 months and 15 months

3. Lamina Dura (LD)

- Absent = 0
- Discontinuous = 1
- Continuous = 2

4. Lateral Wall Thickness (LWT)

- Maximum width of distal wall in mm

5. Size of Pulp Canal (PC)

- Maximum size in mm

If the clinical signs and symptoms or the periapical radiolucency appear to increase, the case was considered as a failure and routine apexification procedure was carried out.

Statistical Analysis

All the statistical analysis was performed using SPSS statistical package (version 13) for windows. McNemars Chi-square test and Paired t test was used to identify the overall difference in qualitative and quantitative variables respectively. The level of significance was set at P <0.005

Results

On clinical evaluation it was found that two out of twenty nine cases had abscess, six had pain, 21 cases pain on percussion and for 5 cases mobility, before the treatment. It was observed that all the signs and symptoms of periapical infection were resolved within 15 months of study period (Table 1).

Discoloration of the involved tooth was present only in 4 (13.8%) cases preoperatively. By the second visit, discoloration was present in 15 (51.7%) cases. In one month recall visit it became 16 (55.2%) cases and remained the same till the 15th month recall visit.

Abscess was present in 2 out of 29 cases preoperatively which became completely subsided by the 2nd visit itself - that is after the placement of antibiotic paste for 1 week. It also shows that, no abscess was formed in the 15 month follow up period of any of the cases under study.

Pain was absent in 23 cases, mild in 2 cases and moderate in 4 cases, preoperatively. By the second appointment itself pain subsided in all cases and never reappeared, thus evidencing periapical healing.

Grade 1 mobility was present in 4 cases and grade 2 mobility in 1 case, preoperatively which reduced gradually and subsided by the 1 month recall visit, indicating healing of periodontal tissues.

On radiographic evaluation it was found that 22 (75.9 %) cases, showed complete apical closure within the study period (Figures 1, 2 & 3). Out of these, in one (3.4%) case, the apex was closed as early as by 6 months, 9 (31%) cases by 9 months, 2 (6.9%) cases by 12 months and 10 (34.5%) cases by 15 months. In 6 (20.7%) cases, a progressive reduction in the size of apical foramen was noticed in the 15 months follow up period. This suggests that if the follow up period had been extended further, a complete closure could have been noticed. Only in one case no reduction in size of the apical foramen was observed.

Table: 1 – Evaluation of signs and symptoms

Variables	No: cases before treat-ment	No: cases 1 week later	No: cases 6 months recall	No: cases 9 months recall	No: cases 15 months recall
Pain	6	0	0	0	0
Pain on Percussion	21	13	4	1	0
Mobility	5	1	0	0	0
Discolora-tion	4	15	16	16	16

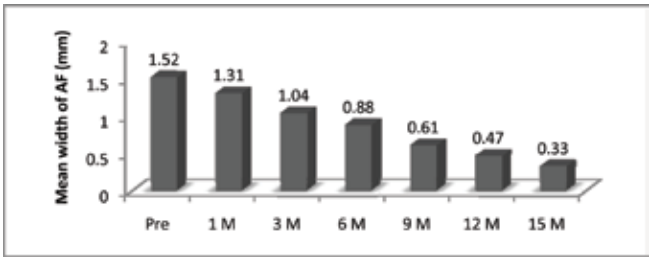
The mean width of apical foramen was 1.52 ± 0.43 mm preoperatively, which gradually reduced to 0.33 0.56 mm by the 15th month recall visit (Graph 1). A statistically significant (P<0.001) gradual reduction in the mean width of apical foramen noticed in each recall visit signifies a normal physiologic closure of the apex.

Preoperatively, the periapical radiolucency was present in 12 (10.62%) cases and its mean area was 10.62 14.75 mm2. The size of the radiolucency gradually reduced (P = 0.001) and resolved completely by 12th month suggesting good periapical healing and regeneration of tissues (Graph 2).

Lamina dura was absent in six (20.7%) cases and discontinuous in 23 (79.3%) cases preoperatively. After one month it was absent only in five (17.2%) cases, discontinuous in 22 (75.9%) cases and continuous in two (6.9%) cases which became discontinuous in five (17.2%) cases and continuous in 24 (82.8%) cases after 15 months. The appearance and progressive extension of lamina dura noticed in each recall visits hints at the considerable amount of periodontal healing that might have occurred following the revascularization procedure.

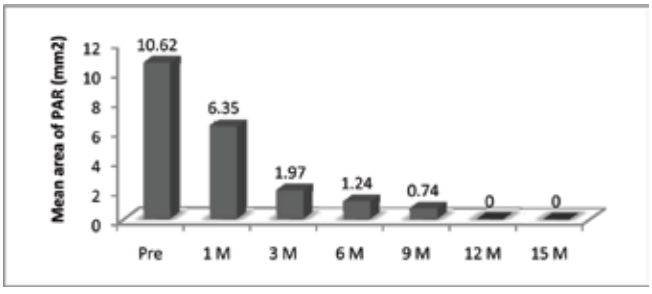
The mean lateral wall thickness was 1.85 ± 0.35 mm preoperatively which was increased to a mean of 2.11 0.47 mm by the 15th month recall visit Also, the width of the pulp

Graph 1 – Width of Apical Foramen



Graph 1 shows that the mean width of apical foramen was 1.52 mm, preoperatively which gradually reduced to 0.33 mm by the 15th month recall visit. A gradual reduction in the mean width of apical foramen was noticed in each recall visit which signifies a normal physiologic closure of the apex.

Graph 2 – Size of Periapical Radiolucency



Graph 2: Periapical radiolucency was present in 12 out of 29 cases and its mean area was 10.62 mm2 preoperatively. The size of the radiolucency gradually reduced and resolved completely by 12th month suggesting good periapical healing and regeneration of tissues.

canal space was reduced from a mean of 2.10 ± 0.60 mm preoperatively to a mean of 1.85 ± 0.60 mm after 15 months. Both changes were statistically significant (P<0.001). This denotes the strengthening of the roots of the teeth following pulp revascularization procedure.

Discussion

Pulp revascularization procedure is a novel technique which favors continued root formation, thickening of lateral walls and apical closure in a necrotic immature permanent tooth. This helps to overcome the shortcomings of conventional apexification procedures using calcium hydroxide or MTA. In the present study, the clinical signs and symptoms of periapical infection had significantly reduced in each recall visits and all the signs and symptoms subsided completely within the study period.

Ding et al 2009[9] and Shah et al,[11] conducted similar clinical studies on pulp revascularization procedure, and they observed complete resolution of clinical signs and symptoms and healing of periapical lesions within their study period of 3 ½ years and 1 ½ years respectively. None of the cases presented with pain

CASE 1

Non-vital tooth:- 11

(A) Preoperative Radiograph (B) Immediate Postoperative Radiograph (C) 12 months Postoperative Radiograph

Figure 1 shows the preoperative and postoperative radiographs of nonvital (due to caries) maxillary right central incisor in an eight year old boy. (A) Preoperative radiograph showing pulp exposed 11 with open apex and divergent root canal. The pulp canal is wide and the lateral root walls are thin. (B) Radiograph just after the completion of pulp revascularization procedure. The root canal orifice was sealed with MTA and the access cavity with light cure GIC and composite resin. (C) 12 months postoperative radiograph. The apical foramen was closed; pulp canal became narrow and the thickness of the lateral walls of root increased as compared to the preoperative radiographs.

CASE 2

Non-vital tooth:- 35

(A) Preoperative Radiograph (B) Immediate Postoperative Radiograph (C) 9 months Postoperative Radiograph

Figure 2 shows the preoperative and postoperative radiographs of nonvital (due to an occult caries) mandibular left second premolar in a 12 year old girl. (A) Preoperative radiograph showing pulp exposed 35 with open apex, divergent root canal, wide canal space and thin lateral root walls. Periapical radiolucency, bone loss and absence of lamina dura are also noticeable. (B) Radiograph just after the completion of pulp revascularization procedure. (C) 9 months postoperative radiograph. There is complete resolution of the periapical radiolucency, bone regeneration and presence of a continuous lamina dura. The apical foramen is closed, pulp canal became narrow, and thickness of the root lateral walls increased

or re-infection. But these studies lack statistical analysis of the observations and hence the current study was planned to conduct to get a proper statistical evaluation of the outcomes of pulp revascularization procedure.

Inducing intracanal bleeding plays an important role in the success of this procedure. Using a file to irritate the apex, the fundamental reason to cause the formation of blood clot in canal space which serve as a scaffold to enable three dimensional ingrowth of new tissue.

In the present study no instrumentation of the canal space was performed. The apical tissue beyond the confines of root canal space to form blood clot which serve as a scaffold to enable three dimensional ingrowth of new tissue. This is sort of agreement about importance of stimulating apical bleeding to form the clot that will then act as a scaffold for pulp revascularization.

The excellent periapical and periodontal healing achieved following the triple antibiotic therapy in the present study is in agreement with the studies carried out by Sato et al[12] and Hoshino et al[13] on the antibacterial efficacy of mixed antibacterial drugs. The success of this procedure could be attributed to 1) The effective infection control obtained with the help of triple antibiotic paste 2) The presence of a scaffold inside the canal and 3) A good coronal seal made with MTA and composite resin[8].

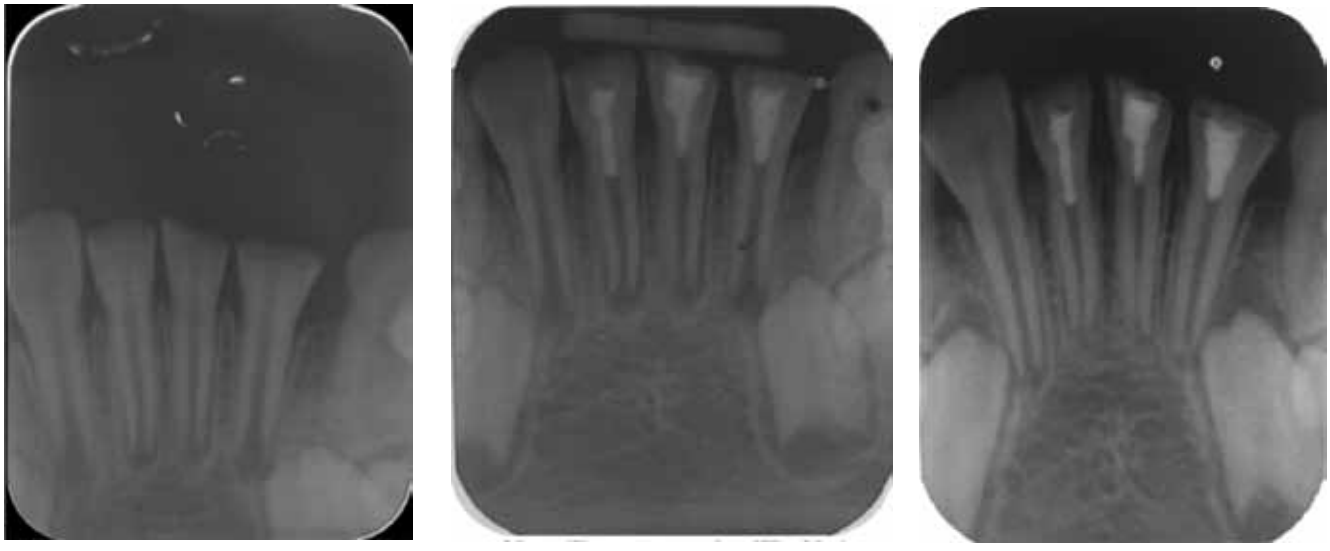
A statistically significant level of discoloration observed in this study is in accordance to the findings of similar studies[14,15], wherein discoloration of tooth occurred in association with triple antibiotic therapy, especially minocycline.

The gradual reduction observed in the size of the apical foramen indicates that the pulp revascularization procedure is very effective in achieving apical closure in necrotic immature permanent teeth (Case 1, 2 & 3). Instead of creating an abrupt closure by the formation of a calcific barrier as in conventional apexification procedures[5], in the present study a gradual narrowing of the apical foramen was noticed. This can be a sign of a more physiological growth of the root which could lead to root lengthening also as observed by Ding et al[9].

The reduction in the mean area of periapical radiolucency, observed in each recall visit indicates excellent periapical healing and regeneration of periapical tissues following pulp revascularization procedure (Case 3). Also, there was a statistically significant improvement in the appearance of lamina dura consistently from third month to the 15th month recall visit indicating healing of periodontal tissues. The increase in the thickness of lateral walls and the reduction in the pulp canal space prove that the pulp revascularization procedure could lead to a normal physiologic growth of the root there by thickening of the root walls due to hard tissue deposition and narrowing of the pulp canal space and thus strengthening the

CASE 3

Non-vital teeth:-31, 41, 42



(A) Preoperative Radiograph (B) Immediate Postoperative Radiograph (C) 9 months Postoperative Radiograph

Figure 3 shows the preoperative and postoperative radiographs of nonvital (due to trauma) mandibular central incisors and right lateral incisor in a seven year old boy. (A) Preoperative radiograph showing pulp exposed 31, 41, 42 with open apices, divergent root canals, wide canal spaces, thin lateral root walls and discontinuous lamina dura. (B) Radiograph just after the completion of pulp revascularization procedure. (C) 9 months postoperative radiograph. The apical foramina are closed, pulp canals became narrow, thickness of the root lateral walls increased and the lamina dura became continuous.

root (Case 1, 2 & 3). Thus the chance for root fracture during and after obturation of the root canal is reduced. The study conducted by Ding et al[9] Shah et al[11] and Lopez Carmen[16] also supports these findings. They also noticed thickening of dentinal walls and narrowing of canal space in their respective studies.

However, due to the continued deposition of hard tissue in the canal, obliteration of the pulp space occurred in three of the cases studied, in the period of 15 months. Thibodeau et al[17] in their study on pulp revascularization of immature dog teeth, reported that the radiographic thickening of lateral walls of the root canal corresponds to the amount of hard tissue deposited as determined histologically. The histological evaluation in their study revealed a vital pulp like connective tissue inside the pulp canal space. They could also confirm the hard tissue deposition and apical closure histologically.

White et al[18] and Doyon et al[19] reported that a significant reduction in the strength of the root occurred following the conventional apexification procedures using calcium hydroxide and MTA. In contrast to this the present study showed that by the pulp revascularization procedure, the thickness of the lateral walls of the root increased by hard tissue deposition and thus the root is strengthened further.

In support to the present study, Das et al[20] observed that revascularization occurred more frequently when the teeth were not instrumented and treated with tetracycline. Effective disinfection along with the presence of a suitable scaffold results in the proliferation and differentiation of multipotent stem cells into odontoblasts. These odontoblasts might have deposited tertiary or atubular dentin at the apical end, causing apexogenesis as well as on lateral aspects of dentinal walls of the root canal, causing thickening of the lateral walls, thus reinforcing and strengthening the root[20].

Forghani et al[21] compared the outcome of root development between revascularization procedure and vital pulp therapy performed in two contra lateral incisors. They found that both teeth showed similar root lengthening, thickening of root walls and apical closure, thus proving that the root development attained following pulp revascularization procedure in a nonvital tooth with apical periodontitis is similar to that of vital pulp therapy. Progressive periapical radiolucency resolution, Progressive increase in dentinal wall thickness with increased root length and continued root development as observed in the present study was reported by El Ashiry, Eman A et al[22] in their study on dental pulp revascularization of necrotic permanent teeth with immature apices.

Advantages of Pulp Revascularization Procedure

When compared to the conventional endodontic treatment for necrotic immature permanent teeth, the revascularization procedures holds the following advantages.

- It allows for a normal physiologic development of root in non vital immature permanent teeth.[21]
- The compromised crown root ratio and chances of root fracture can be overcome by the pulp revascularization procedure[8, 22].
- Obturation of the canal is not required always[22].
- Even if future endodontic treatment becomes necessary, a more successful outcome can be expected due to the thickened root walls[17].

Limitations of the study

- Small sample size
- Deposition of hard tissue can continue further leading to the complete obliteration of the canal. This can forbid any future endodontic treatment if required.
- Discoloration of teeth due to triple antibiotic therapy is another disadvantage observed from this study.

► Conclusion

The pulp revascularization procedure is an effective treatment protocol for the management of non vital young permanent teeth, though with a few limitations. The procedure is comparatively easy to perform and can be a better alternative to the traditional apexification procedures using calcium hydroxide or MTA. The following conclusions can be made from this study.

The pulp revascularization procedure in necrotic immature permanent teeth led to complete resolution of the clinical signs and symptoms like abscess, pain, pain on percussion and mobility.

The statistically significant resolution of the periapical radiolucency and improvement in the appearance of lamina dura of the non vital immature permanent teeth was observed following pulp revascularization procedure.

Normal physiologic root development, as confirmed by the gradual apical closure, thickening of root dentinal walls and narrowing of pulp canal spaces was achieved by the pulp revascularization procedure.

Discoloration of tooth and complete obliteration of the pulp canal space have turned out to be the disadvantages of this technique.

Thus it can be concluded that the pulp revascularization procedure is an effective alternative to the other established treatment protocols for the management of necrotic young permanent teeth in children. However further long term and comparative studies are needed to validate this statement.

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Medical management of carious lesion with silver diamine flouride drops; a report of 3 cases in preschool children

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Abstract

Untreated decay in young children is a significant health challenge and it affects the quality of life of children as well as their parents. There is a paradigm shift from surgical to medical management of dental caries. Silver Diamine Flouride (SDF) is a topical medicament used to treat and prevent dental caries. It is a colourless ammonia solution containing silver and fluoride ions, which is dissolved in water containing ammonia. It contains about 25% (w/v) silver as an antimicrobial agent, 8% ammonia as the solvent and 5% sodium fluoride as remineralisation agent. SDF can cause permanent dark discolouration of teeth, temporary discolouration of skin and mucosa and pulpal irritation in deep caries. Because of these problems, SDF had poor acceptance among patients, parents and even clinicians. Discolouration of SDF can be removed with potassium iodide solution. This paper describes medical management of carious lesions in preschool children with 38 % SDF.

Key words; dental caries, preschool children, SDF

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The dental caries awareness among public has improved and dental treatment techniques have advanced in the past few decades. But dental caries remains a global health problem. Untreated decay in young children remains a significant health challenge and affects the quality of life of children and their families. Dental visits will be fearful and anxiety stimulating for the child. We can use various pharmacological as well as non pharmacological behaviour management techniques for effective dental treatments in children. Dental treatment in young children and those with special health care needs often require advanced pharmacologic behaviour guidance modalities like sedation or general anaesthesia. But dental treatment of very young children under general anaesthesia is not acceptable to most of the parents. The U.S. Food and Drug Administration has issued a warning that repeated or lengthy use of general anaesthetic and sedation drugs during surgeries or procedures in children below three years may affect their brain development[1].

There is a paradigm shift from surgical to medical management of dental caries. Silver Diamine Flouride (SDF) is a caries arresting agent which was introduced in the 1960s. SDF is a topical medicament used to treat and prevent dental caries. It is a colourless ammonia solution containing silver and fluoride ions, which is dissolved in water containing ammonia. It contains about 25% (w/v) silver as an antimicrobial agent,8% ammonia as the solvent and 5% sodium fluoride as remineralisation agent. The U.S. Food and Drug Administration (FDA) cleared the new formulation of 38% SDF in 2014 as a class II medical device. In the US, it is available as Advantage Arrest in a cavity varnish format. In India, it is available as Fagamin (38 % SDF).

AAPD (American Academy of Pediatric Dentistry) 2017 guidelines suggest the clinical practices involving the application of 38 % SDF to enhance dental caries management outcomes in children and adolescents, including those with special health care need[2]. They recommend usage of SDF in young children till a definite treatment can be provided. The Silver diamine fluoride is a metal ammine complex of silver fluoride. SDF can cause permanent dark discolouration of teeth, temporary discolouration of skin and mucosa and pulpal irritation in deep caries. Hence the SDF had poor acceptance among patients, parents and even clinicians. Currently, it has become popular for its effectiveness in arresting carious lesions

Discolouration of SDF can be removed with potassium iodide solution. Potassium iodide will remove the silver ions and reduces the discolouraion. We can also use SDF as an interim therapeutic restoration (ITR) along with glass ionomer

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cement. SDF can be used to arrest the carious lesion and glass ionomer cement (GIC) restoration can be given, to mask the discolouration. This paper describes medical management of carious lesions in preschool children with 38 % SDF.

Case 1

A 4-year-old girl was brought to the outpatient department with decay concerning lower right first deciduous molar. The child was uncooperative for conventional treatment modalities. Treatment under general anesthesia or under sedation techniques were explained to the parents. SDF application of carious lesion was also explained. The parents opted for SDF as it was a non-invasive technique. Discolouration property of SDF was informed and consent was obtained from parents. Petroleum jelly was applied to adjacent mucosal surfaces to prevent discolouration. Soft tissue isolation was done with cotton rolls. Carious lesions were arrested with 38 % SDF. The solution was applied for 1 minute. Patient was instructed not to eat or drink anything for the next 1 hour. Immediate discolouration was noticed on 84 and 85. Patient was reviewed after 1 month. The discolouration on 84 and 85 was increased. But carious lesion was arrested and the patient was asymptomatic. On probing, the hard eburnated dentine was felt. The parents were satisfied with the outcome. The behaviour of the child was remarkably improved in the review appointment.

Case 2

Three and half-year-old girl child reported with dentinal caries on her mandibular right first molar. The child was not cooperative for the restorative treatments. The parents were not willing for treatment under general anesthesia or sedation techniques. The parents readily accepted SDF application and they were not concerned about the discolouration. Informed consent was obtained and carious lesion was treated with 38 % SDF for 1 minute after isolation and protection of soft tissues. The patient was reviewed after 1 month. The child was more cooperative during the second visit. There was no history of pain or any other discomfort concerning the tooth.

Case 3

The 3-year-old boy was brought with caries on his maxillary anterior teeth. The patient was not willing for any invasive treatment. All the treatment options were explained to the parents. They opted for SDF application till a definitive care can be provided. Dentinal caries on his maxillary anterior teeth were arrested using 38 % SDF after getting the consent from parents. When the patient was reviewed after 1 month, parents were satisfied as the tooth was asymptomatic during this period. The behaviour of the patient was also satisfactory in the second visit

All the patients were reviewed every 3 months, 6 months for one year. Carious lesions were arrested and the teeth were asymptomatic throughout the review period.

► Discussion

For a child in the pre cooperative stage, or a child with special health care needs, conventional restorative treatment modalities for dental caries may not be possible.

They may need treatment under sedation or general anesthesia. According to Chu and Lo, conventional treatment is unavailable or unaffordable for many children[3,4]. SDF is

Case 1



Case 2


Case 3


indicated for dental caries lesions, difficult to treat in a single visit. AAPD recommend it in caries management of behaviourally or medically-challenged children and for patients without access to proper dental care. It is also beneficial for non-invasive treatment of deciduous teeth about to exfoliate and for patients reporting pain from dentin hypersensitivity.

Studies have found that SDF is cost-effective, painless and simple and it is effective in caries management of young children or patients with special needs. Chances of cross-infection are very low with the use of SDF, as we are using disposable applicator tips. According to a study by Nuvvula et al., 3.8 % SDF has similar anti-microbial activity as 2% Chlorhexidine[5]. So we can use it as an alternative medicament to achieve the sterilization of infected root canals[5].

SDF can cause permanent black staining of tooth. It can also cause staining of skin and oral tissues. So proper isolation is mandatory during the treatment session. Isolation can be done with cotton rolls in uncooperative children. Rubber dam isolation can be done in cooperative children. Petroleum jelly can be used for the protection of adjacent soft tissues. SDF can also cause staining of clothes, countertops etc. But this is temporary and can be removed with normal cleaning agents. So before starting treatment, pros and cons should be discussed with patients and parents. A written informed consent should be obtained before treatment.

We can apply a saturated solution of potassium iodide (KI) immediately after SDF application[6], to mask the discolouration. But this will remove the silver ions and can reduce the effectiveness of SDF. As the main ingredient is silver, SDF is contraindicated in patients with silver allergy.

Fluoride toxicity was a concern with the use of SDF. SDF at 38% has high fluoride content of about 44,800 ppm[7]. But a very small amount of SDF solution is applied on a carious lesion. According to Gao et al, occasional application of SDF is well below the concentrations associated with toxicity.[1] Drop of 38% SDF per 10 kg of body weight per treatment visit is the current dosage of SDF[8]. Many case studies have shown that 1 drop of liquid can be used to treat up to five teeth.

According to Chu et al, caries removal was not necessary before SDF application. Studies have reported that SDF was better than glass ionomer cement or fluoride varnish in arresting carious lesions in primary teeth. The application frequency could be one-off or repeated applications every 3, 6, or 12 months. But the semi-annual application was more successful than the annual application. One study reported that increasing the application frequency increased the caries arrest rate of SDF application[9].

Yasmi et al. has evaluated the parental acceptance of SDF. Most parents (67.5%) judged SDF staining on the posterior teeth to be aesthetically tolerable. Only 29.7% of parents made this same judgment about anterior teeth (P<.001). Parents' acceptance of the treatment also varied according to their socioeconomic status[10].

► Conclusion

Semi-annual application of 38 % SDF is effective in arresting caries in children without any severe adverse effects. SDF is useful in management of carious lesions in very young children or children with special health care needs, till a definite care can be provided. But it has poor patient and parent acceptance due to discolouration. So motivating parents is very important before application of this medicament. There is no consensus on its number and frequency of application till date. Further studies are necessary to develop guidelines on its use in children and adolescents.

► Conflicts of Interest

The authors declare no conflicts of interest

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Medical mission to Nigeria-An Insight

*P. Santhosh Kumar, Kanhangad

Dr. P. Santhosh Kumar

I had been to Nigeria for two weeks on a medical mission sponsored by Rotary International and I would like to share some of my experiences here.

The concept of this "Rotary India-Nigerian Medical Mission is to provide free surgical treatment to the needy patients and to upgrade the surgical experience of local surgeons. The doctors having service mind, sufficient experience, knowledge and skill of using modern technolog and also having ability to adapt to the circumstances prevailing in the host country were selected for this noble project.

A team of 20 surgeons from different specialties comprising of 2 General Surgeons, 3 Anesthetists, 2 Orthopedic Surgeons, 2 E.N.T Surgeons, 4 Ophthalmologists, 1 Pediatric Surgeon, 3 Gynecologists and 3 Dental Surgeons were selected from Maharashtra, Karnataka, Tamil Nadu and Kerala for this Rotary Indo-Nigerian Medical Mission. This mission was supported by Global Grant Project of the Rotary Foundation and the total cost of this project is 90,000US Dollars. From Kerala State, Rtn.Dr. Santhosh Sreedhar and myself was selected for this mission.Rtn.Dr.Makarand from Bhusaval, Maharashtra was also included in our team.Rtn.Dr.E.K Sagadevan, a general surgeon and Past District Governor of Rotary District 3202 was our Team Leader.

We started our journey on 29th January from Mumbai to Abhuja, the Capital city of Nigeria. It was a 14 hours travel. From Abhuja we travelled to Jos, plateau state –City of Peace and Tourism which is about 5 hours drive on the road. Our destination was Jos University and Teaching Hospital. It is a fairly big hospital but in no way can be compared to our teaching institutions. After a warm welcome, we have visited all the departments in the hospital.

The Dental Department was very small only two dental chairs that too not functioning properly. Our IDA Coastal Malabar Branch along with contributions from its members donated about Rs 50,000 worth instruments and materials to the Department of Dentistry. Apart from that the Rotary also contributed Equipments, Instruments and materials worth

Donating instruments

with nigerian dental association officials

Jos university teaching hospital

pre and post treatment cases

around 2 lakhs. It included endo motor, apex locator, surgical handpiece, miniplates and screws, Airotor handpiece,set of extraction forceps, elevator kit etc to name a few.

We were ready to work from 8 am to 6 pm but their working hours was from 9 am to 3 pm only with saturday and sunday as holiday. So on the first day we didn't get much cooperation from the staff as we expected. On enquiry we could understand the dental nurses and assistants skip breakfast and/or lunch daily due to financial constraints. So by the next day onwards food were supplied by our team and then onwards they cooperated full heartedly.In the Dental Department, they do very few procedures every day. The staff especially the Dental Nurses and Resident Doctors was very eager to assist us. Dr.Otuyomi an Endodontist managed our workload efficiently. All the residents were very keen in observing the treatment procedures.

The inflow of patients was in large volume just like in our Govt. Hospital. These patients were suffering in silence for two reasons,- absence of quality dental treatments and inability to afford whatever was available in local hospitals.

clinical demonstration

with residents and staff

To our surprise, the treatments are not free in government hospitals; in fact it is much costlier than our private hospitals. So we could see many young men and women having mutilated anterior teeth roaming around without any treatment. We were happy to treat many such cases with RCT, composite buildup and the smile and gratitude they expressed cannot be put in terms of money. We could do more than 200 dental procedures which included Extractions, RCT, Composite Restorations, Episectomy, Biopsy and Cyst Enucleation etc...We did a case under general anesthesia also, biopsy of a young girl with a clinical diagnosis of fibrous dysplasia.

Patients and relatives coming after few days to express their gratitude was a new experience for us. We gave clinical demonstration lectures to residents.myself also had an opportunity to deliver lecture on "History of dentistry"to resident doctors and faculties in the dental college and it was very well appreciated.

All together it was a most gratifying experience.

Our past Nationa Vice President Dr. Santhosh Sreedhar was also eager to do Dental Association activities there also .He took interest in meeting the president and members of Nigerian Dental Association. The Chairman of Nigerian Dental Association of Plateu State Dr.Taiwoo and Secretary Emmanuel invited us for a meeting and dinner.Dr. Santhosh Sreedhar explained the IDA activities in detail to them. They were very eager to get in touch with our association in future. They requested IDA to support by undertaking a worthy project to improve the academic interest of the Dental students of Nigeria.

This mission was a life changing experience for me. One understands that basically all humans are same everywhere. We all have same emotions, needs, concerns, creativity, sense of cooperation and so also selfishness, ambition, greed, anger, fear and so on. But what binds us together is the sense of humanity, affection for each other and care for all.

Through this mission we not only provided the health care to the needy and poor but also acted as goodwill ambassadors of India and were successful in establishing friendly relationships with the people of host countries.

Really I felt happy and blessed to treat and do surgery for the deserving poor patients. Felt proud to teach the local resident doctors. Also feeling wonderful to work and learn with the dedicated colleques.I thank Rotary Foundation for sponsoring this Noble Project. And I will cherish these memories of Rotary humanitarian Service Project for ever.

Mavelikkara Branch

Wayanad Branch

The installation ceremony of IDA Wayanad branch was held on 04/01/2020. District collector Mrs Adhela Abdulla IAS was the chief guest. Kerala state Dental association president elect Dr Joseph CC installed Dr Ranjitk CK as the 15 th president of IDA Wayanad branch

Tripunithura Branch

Thamarassery Branch

Photo of installation of IDA Thamarassery branch

NedumbasseryBranch

Vadakara Branch

Eranad Branch

7th Installation ceremony of " Indian Dental Asocciation"Eranad branch of IDA Kerala state was held at Shifa convention centre, Perinthalmanna on 19/01/2020 at 6 PM.

The installation ceremony was held in the presence of Dr.Joseph C.C(President elect-IDA Kerala state) as guest of honour and Dr.George Abraham (3rd vice president IDA Kerala satate)as Installing officer.

A curtain raiser for CDH current year activities took place with symbolic inauguration of "JANANI" Is a year long Cummunity Dental Health Programme for Pregnent Women in Ernad region by Dr.Joseph CC (President elect IDA kerala State)

On the Installation day, 87 IDA Ernad membes were attented,and total there were 180 participants including family members.Distinguished guests from various IDA branches (IDA Malappuram,IDA Trichur &IDA Nedumbasery) attended the programme.

Variety entertainment programmes by our members including Songs,Dance, comedy skits and U.V light were excellent in all ways and followed by appetizing feast.

Chalakkudy Branch

Central Kerala - Kottayam Branch

Palakkad Branch

Malabar Branch

Dr Shaju Mandoli installed as the new president of IDA Malabar branch by Dr Joseph C C, the President of IDA KSB on 16th feb 2020 at Hotel Malabar Palace. Sri M K Raghavan M P was the chief guest of the function. The guests of honour were Dr Deebu J Mathew, Hon. Secretary IDA KSB, Dr Abhilash G S, IPP IDA KSB. Representatives from State branch and our neighboring branches & Members of IDA branch with family and kids attended the auspicious occasion of the installation 2020 & the 1st family meet.

Kochi Branch

Trivandrum Branch

Malappuram Branch

Installation ceremony for the year 2020 was held on 09/02/20 at Rydges inn Kottakal. State president Dr Joseph C.C was the chief guest for the occasion. State secretary Dr Deebu J mathew was the guest of honor.Project inauguration was done by Dr. Sushanth (state CDH chairman).

Dr Mahesh k Joy and his team of office bearers took over the office. State secretary Dr Deebu Jacob was also honored the same day.Around 130 members attended the function.

Kodungallur Branch

Installation of the office bearers of IDA Kodungallur Branch 2019 -20 was held on 22nd December 2019 at IMA Hall, Kodungallur at 6.30 pm. Dr. Jolly EF was installed as the new president of IDA Kodungallur Branch by Dr Abhilash G (President, IDA Kerala State) was the Chief guest and Installation officer. Outgoing President Dr.Laju S handed over the President's Collar to newly installed President. Hon.Secretary Dr.Plato Palathingal reported the activites of IDA Kodungallur branch for 2018-19. Vote of Thanks was delivered by Hon. Secretary Dr Plato Palathingal followed by Dinner.

Coastal Malabar Branch

The Installation Ceremony Of IDA coastal malabar was held on 15th December 2019 at Sreevalsam Auditorium Payyanur. Dr US Krishnanayak was the chief Guest and Dr Joseph C C and Dr Suresh kumar G were the Guest of Honour .

Thrissur Branch

IDA Thrissur installation

Malanadu Branch

Pathanamthitta Branch

Quilon Branch

28th installation ceremony of IDA Quilon branch was held on 18th January 2020 at Rotary community hall kollam.

Dr Ciju P Cherian as the president and his team of office bearers were installed in the presence of the past VC of KUHAS dr MKC Nair , ida kerala state president Dr Abhilash G and Vice president Dr Jinu Mathew Vaidyan.

Dr Deepu Mohandas is the new Hon: secretary and Dr Arjun S is the new Hon treasurer of the branch.

Alappuzha Branch

IDA Alappuzha conducted installation of 21 president Dr. Mili James and office bearers on 29.12.19 at hotel Palmyra.

Thiruvalla Branch

Dr Simon George was sworn in as the 12th president of IDA TVLA branch, Dr Joseph C C the incoming President of IDA Kerala state was the chief guest.

Kottayam Branch

Valluvanadu Branch

Karunagappalli Branch

Kunnamkulam Branch

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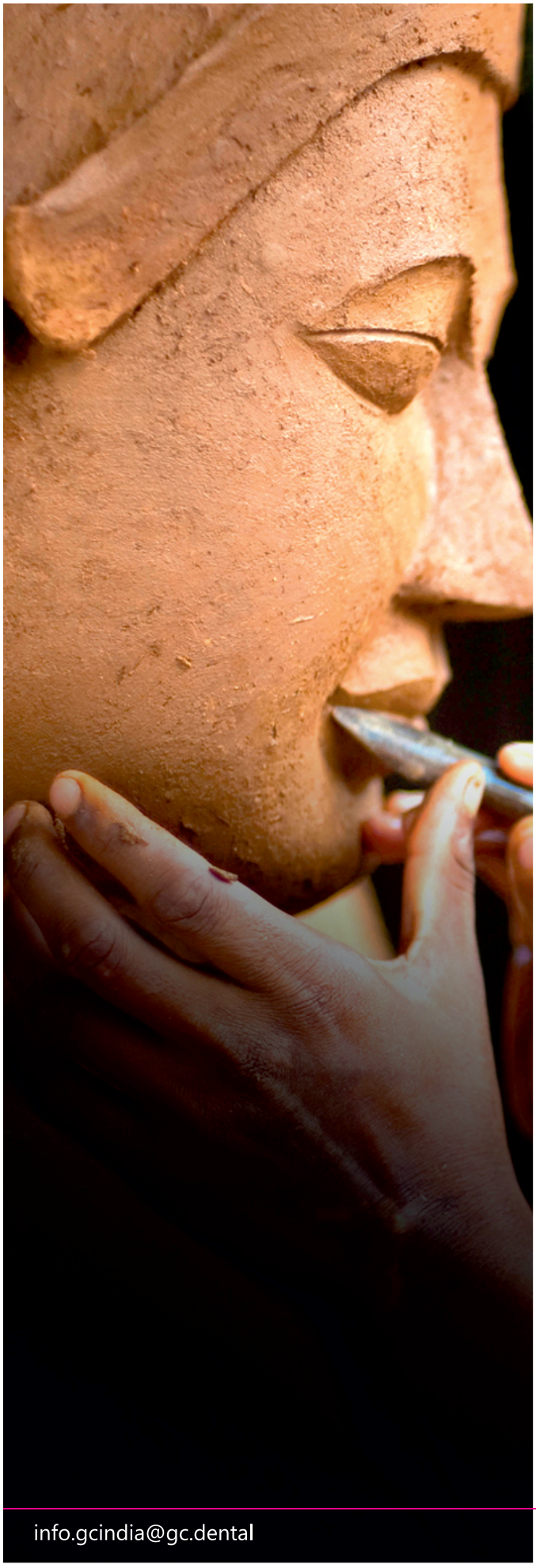

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