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Gujarat State Branch

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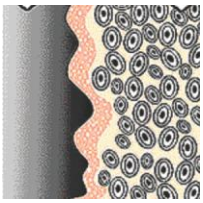
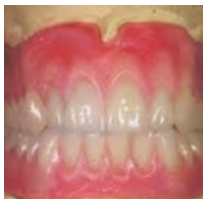
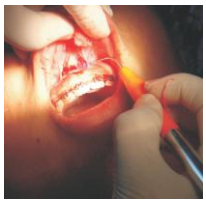
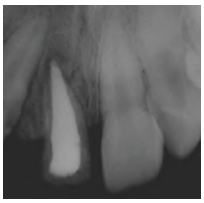

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Editorial

Dear Colleagues,

CBCT in Dentistry has opened newer avenues for Diagnosis and treatment planning in Dentistry. The Applications are not limited to Orthodontics and Implants. It is also an excellent tool for Endodontics, Periodontics, Maxillofacial Surgery including Orthognathic work. There are multitudes of machines available and currently the best are the hybrid variety that have integrated OPG and Ceph mode along with Endo and ENT modes. There were initially issues about the radiation dose but it is nevertheless far less than the CT scans and now machines have evolved that give results with extreme low doses. The future of CBCT presently looks quite bright.

This is probably my last editorial as Hon. Editor of the IDA Gujarat State Journal. I endeavored to serve as diligently as possible and bring out issues of high Quality with good articles. The Dental industry is caught in a Stand still economy making it utmost difficult to generate revenue in terms of advertisement and Sponsorship. We utilized our personal resources and contacts to make funds available for good quality paper printing in color to maintain standards. But even than the break even was not possible.

However, the new Editor may take the Journal higher. I wish him/her the best. I thank all those who, directly or indirectly supported this noble cause. I hope you all made maximum out of the Issues that were published during my tenure. Happy reading to all.

Thank you.

Prof. Dr. Amish Mehta
Hon. Editor

Greetings from IDA GUJARAT STATE BRANCH

Our Dear members,

The Issue of Dentimedia of this year is in your hands and we are happy for the same. We do understand the nitty gritty involved in the printing. We should place our complete faith in the editorial team and help generate maximum possible resources for the timely publication and printing of the same.

This year has been vibrant with activities at the State and National level of IDA. We are sure you all have enjoyed, participated and enriched by all the activities. The AWDC (Annual World Dental Congress) FDI 2014 of the World Dental Federation is back in India in September 2014. We are proud of the fact and will surely work towards the success and urge all of you to participate in large numbers.

The Social Security Scheme of IDA Gujarat State Branch is a very unique family benevolent Program, and we request you all to enroll yourself at the earliest. It's very low cost with maximum benefits to your family. For details contact the Chairman, Dr. Dilip Vora or Dr. Nitin Parikh.

The State Dental Conference of IDA Gujarat State 2013 is in Vadodara in November and We are sure there will be maximum participation from our members. Please contact Dr. Yogesh Chandarana for details.

Yours in IDA, Jai Hind Jai IDA,

Dr. Rajendra Desai
President

Dr. Nitin Parikh
Hon. State Secretary

CONTENTS

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Osseointegration and Dental Implants

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Abstract :

Osseointegration and dental implants offers a comprehensive guide to the state of the art of implant dentistry. The purpose of this review article makes an attempt to give comprehensive description of osseoinegratoin, its history, cellular background, mechanism of osseointegration, re-osseointegration and the factors involved in the phenomenon termed osseointegration.

Key Words : Bone to implant interface, osseointegration, dental implants

INTRODUCTION

Missing teeth and their various attempts to replace them has presented a treatment challenge throughout human history. Different procedures initiated have resulted with varied success. Implants have been used to support dental prosthesis for many decades, but they have not enjoyed a favourable position. However the use of dental implants has increased by leaps and bounds ever since the concept of osseointegration was identified and accepted[1,2,3]

The word 'osseointegration' consists of 'os' the latin word for bone and 'integration' derived from latin word meaning state of being combined into a complete whole[4]. Originally it was defined as direct bone deposition on the implant surfaces. It is a direct bone anchorage to an implant body, which can provide a foundation to support a prosthesis; it has the ability to transmit occlusal forces directly to the bone[5](Illustration 1).

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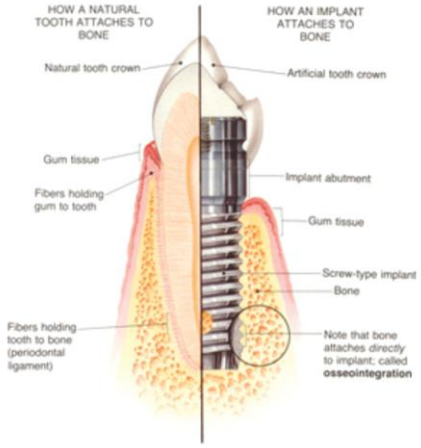


Illustration 1

Later Schroeder[6] used the term 'functional ankylosis' to describe the rigid fixation of the implant to the jaw bone and stated that 'new bone is laid down directly upon the implant surface, provided that the rules for atraumatic implant placement are followed and the implant exhibits primary stability'. In a more comprehensive way, osseointegration is characterized as direct structural and functional connection between ordered living bone and the surface of a load bearing implant[7,8]. It is now said that an implant is regarded as osseointegrated when there is no progressive relative movement between the implant and the bone, with which it has direct contact. This implies that there is an anchorage mechanism where non-vital components can be reliably and predictably incorporated into the living bone and this anchorage can persist under all normal conditions of loading. Osseointegration can be compared with direct fracture healing, in which the fragment ends become united

by bone, without intermediate fibrous tissue or fibrocartilage formation[9]. However, a fundamental difference exists, osseointegration unites bones not to bone, but they exhibit proper initial fixation (stability) following installation in the recipient site. This initial stability is the result of the contact relationship or friction that is established following insertion of the implant, between mineralized bone (often cortical bone) at the recipient site and the metal device.

HISTORY

In 1952, Per Ingvar Branemark[10,11,12,13] of Sweden conducted an experiment where he utilized a titanium implant chamber to study blood flow in rabbit bone. At the conclusion of the experiment, when it became time to remove the titanium chamber from bone, he discovered that the bone had integrated so completely with the implant that the chamber could not be removed. Branemark called the discovery (osseointegration) and saw the possibilities for human use(Illustration 2).

The implementation of osseointegration started in the

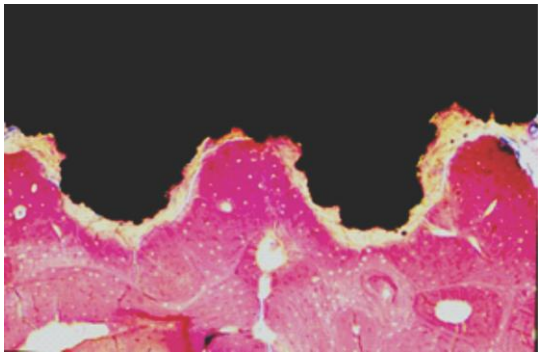


Illustration 2 – Titanium Implant (black), integrated into bone: Histologic section

1960s as a result of Branemark's work.

1970s: Schroeder worked independently from Branemark, with research on direct bone anchored implant and proved a direct bone to implant contact.

Thus the history of Branemark system can be divided into 3 stages:

- Early stage (1965 – 1968)
- Developmental stage (1968 – 1971)
- Production stage (1971 – present)

Today osseointegration is a highly predictable and common place treatment modality[4].

THEORIES

Two theories regarding the chemical mechanism by which endosteal implants integrate with bone have been proposed. Osseointegration as defined above, contrasting with fibro-osseous integration, in which soft tissue such as fibres and / or cells are interposed between the two surfaces[15,16]. They are[17,18]

1. Fibro-osseous integration supported by Linkow, James and Weiss[19] (1986)
2. Osseointegration supported by Branemark (1985)

1. Fibro-osseous integration: -

It refers to the connective tissue made up of well-organized collagen fibers, present between bone and implant as shown[20,21]. It can be defined as 'tissue to implant contact with healthy dense collagenous tissue between the implant and bone[22]. According to Weiss who is a proponent of this theory, there is presence of collagen fibers at the interface between the implant and the bone and interprets as a peri-implant membrane with an osteogenic effect. In this theory, collagen fibers function similarly to sharpey's fibers in natural dentition. When the function is applied, the difference between the inner aspect (compression) and the outer aspect (tension) of the connective tissue component results in bio-electric current and this induces differentiation into connective tissue components associated with bone maintenance. However, the collagen fibers around the implant are arranged irregularly, parallel to the implant body and thus, when forces are applied, they are not transmitted to the fibers as seen in natural dentition. Therefore, bone remodelling cannot be expected to occur.

What is wrong with Fibro-osseous Integration?

Although fibro-osseous dental implants showed initial promise, they have been a disappointment in the long term. Implants that are fixed in the bone socket by the growth of connective tissue initially perform fine. But they tend to fail over time. When these failed implant are removed and inspected, the collagen fibers are seen growing parallel to the implant rather than directly into contact with it like

natural periodontal ligament. Distractors of the fibro-osseous method of implantation believe this simply isn't a strong enough connection to stand up to the forces of biting and chewing that teeth are subjected to through the years.

2. Osseointegration

The direct bone to implant interface without intervening connective tissue was described as early as 1939 by Stock and more recently by Branemark et al[23,24].

It is defined as the contact established without interposition of non-bone tissue between normal remodelled bone and an implant entailing a sustained transfer and distribution of load from the implant to and within the bone tissue. It is now said that an implant is regarded as osseointegrated when there is no progressive relative movement between the implant and the bone with which it has direct contract. In practice it means that in osseointegration there is an anchorage mechanism whereby nonvital components can be reliably and predictably incorporated into living bone and this anchorage can persist under all normal conditions of loading. The Branemark implant bas been shown to distribute vertical and slightly inclined loads more equally into the surrounding bone[25]. A 80-100% success rate has been reported after a 15 year longitudinal study of osseointegrated implants in the treatment of edentulous jaws. They felt hat the term osseointegration implied firm, direct and lasting connection between vital bone and implants and it can be achieved by delicate surgical technique, a long healing period and proper stress distribution when in function[26]. A schematic diagram of fibro-osseous integration and osseointegration is shown in Illustration 5 and Illustration 6

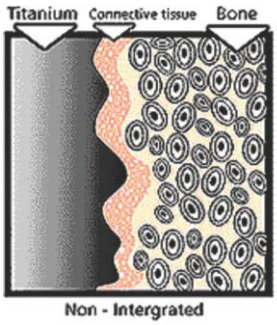
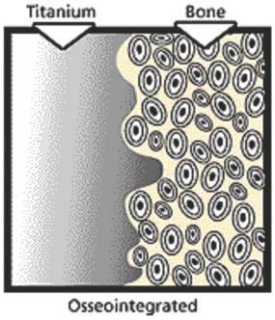


Illustration 5
Fibro-osseous integration



Illsutration 6
Osseointegration

MECHANISM OF OSSEOINTEGRATION[4]

The healing process with the implants is the same as normal bone healing, either primary or secondary bone healing. Primary bone healing occurs at a fracture site with a clean break and there is well organized bone formation with minimal granulation tissue formation. To duplicate the primary healing process, the surgery should be performed on healthy bone, free from infection or necrotic tissue. Secondary bone healing occurs where a large defect or large fracture site precluded close approximation of the two sites. In contrast to primary bone healing, secondary bone healing may have a granulation tissue formation and infection at the site, prolonging the healing period.

Osseointegration occurs in 3 phases:-

1. Osteophyllic phase
2. Osteoconductive phase
3. Osteoadaptive phase

Osteophyllic phase:-

When the implant is inserted into the cancellous bone, hematoma is initially present between the implant and the bone and only small amount of bone is in contact with the implant. During the initial interaction, numerous cytokines are released and by the end of first week, the body mounts a generalized inflammatory response.

An implant site 2 weeks after installation surgery shows that woven bone with primary osteons has formed at the base of the surgical site and also in the furcation site of the implant surface.

An implant site after 4 weeks of wound healing show the presence of newly formed woven bone which lines most parts of the implant surface. This newly formed bone represents the first phase of true osseointegration.

An implant site after 8 weeks after insertion of titanium screw shows typical secondary osteons with concentric lamellae and a central haversion canal can be observed in the lamellar bone within the zone of press-fit and in the adjacent bone tissue.

Osteoconductive phase:-

An implant site after 4 months: The bone cells lay down the osteoid and spread along the metal surface. The newly formed lamellar bone, next to the implant, is continuous with the more lightly stained old bone tissue. In the apical bone marrow part of the site, a thin rim of lamellar bone can be seen in contact with the implant surface.

Osteoadaptive phase:-

When the implants are exposed and loaded after 4 months, there is reorientation of vascular pattern and the woven bone thickens in response to load transmission and thus bone remodelling occurs.

Osborn and Newesely (1980) proposed 2 different phenomenon through which osseointegration occurs:-

1. Distant osteogenesis:- Osteogenic cells line the old bone surface. The blood supply to these cells is between the cells and the implant. Hence the bone is laid down on the old bone surface itself as shown in Illustration 3

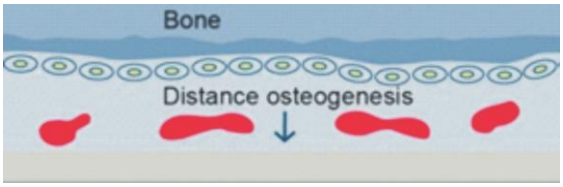


Illustration 3

1. Contact osteogenesis:- Osteogenic cells are first recruited to the implant surfrace. The blood supply is between the cells and the old bone, hence new (denovo) bone is laid down (Illustration 4)

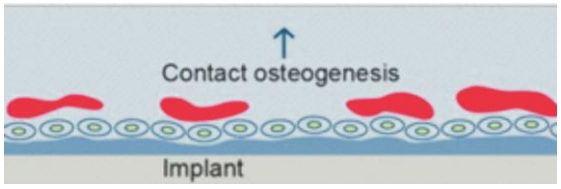


Illustration 4

OSSEOINTEGRATION VS OSSEO-COALESCENCE

Osseointegration refers to physical integration or mechanical fixation of an implant in the bone. Few investigators believe in chemical interaction between the bone and surface of an implant, The term 'osseo-coalescence' has been specifically proposed for such chemical integration. This term refers to calcium phosphate and bioactive glasses which undergo reactions that lead to chemical bonding.

FACTORS AFFECTING OSSEOINTEGRATION[27]

1. Biocompatibility and implant design:-

Implants made of commercially pure titanium have established a benchmark in osseointegration, against which few other materials are compared. Relative material such as niobium, titanium alloys, hydroxyapatite coated implants and resorbable coatings have shown successful clinical results.

a. Implant length
b. Implant diameter
c. Implant shape
d. Surface characteristics

2. Bone factors:-

The stability of the implant at the time of placement is very important and is dependent upon bone quantity and quality as well as implant design.

3. Loading conditions:-

Following installation of an implant, it is important that it is not loaded during the early healing phase. Movement of the implant within the bone at this stage results in fibrous tissue encapsulation rather than osseointegration. Recently is has been shown that immediate loading is compatible with successful osseointegration, provided the bone quality is good and the functional forces can be adequately controlled.

4. Prosthetic considerations:-

Careful planning functional occlusal loading will result in maintenance of osseointegration and possibly increased bone to implant contact. In contrast, excessive loading may lead to bone loss and/or component failure.

Clinical loading conditions largely depend on:

a. The type of prosthetic reconstruction
b. The occlusal scheme

c. The number, distribution, orientation and design of implants
d. The design and properties of implant connectors
e. Dimensions and locations of cantilever extensions
f. Patient parafunctional activities

RE-OSSEOINTEGRATION[28]

It can be defined as the establishment of de novo bone formation and de novo osseointegration to a portion of an implant that during the development of peri-implantitis suffered loss of bone to implant contact and become exposed to microbial colonization. A treatment procedure that aims at re-osseointegration must

1. ensure that substantial regeneration of bone from the walls of the defect can occur and
2. rejuvenate the contaminated (exposed) implant surface.

Various Studies[29,30,31,32] have shown the inflammatory lesions in experimentally induced peri-implantitis can be resolved, de novo bone formation predictably will occur from the hard tissue wall of the defect and large defects may become more or less completely filled with new bone following a treatment that is based on antimicrobial measures. Different techniques have been proposed for rejuvenating the contaminated implant surface which include mechanical brushing of surface, use of air-powder abrasives and application of chemicals such as citric acid, hydrogen peroxide, chlorhexidine and delmopinol. These local therapies are effective in cleaning the titanium surface and allowing soft tissue healing and bone fill in the bone craters, but only limited amounts of re-osseointegration occurred.

Smith and Zarb[33] proposed the following criteria for implant success

1. The individual unattached implant is immobile when tested clinically
2. No evidence of peri-implant radiolucency is present as assessed on an undistorted radiograph
3. Mean vertical bone loss is less than 0.2 mm annually after the first year of function or service
4. There is not persistent pain, discomfort or infection attributable to the implant
5. There is an 85% success rate at the end of 5 year post-operative period with an 80% success rate at the end of 10 years post-operative or function

FUTURE PERSPECTIVES[34]

Still there is much that can be achieved and there is much to learn. Science can achieve great things but two basic problems remain- to minimize the size and number of components and to simplify the prosthesis. Another aspect of osseointegration that we are now beginning to revaluate is that size and length of implants. In some patients, because of the limited amount of bone available, short fixtures are used to provide dental prosthesis. Mathematical and mechanical calculations would suggest that short fixtures are undesirable and would not survive long term.

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Aesthetic Enhancement Of Complete Denture

Dr. Nidhi Chhaparia[a], Dr. Manisha Agrawal[b], Dr. Manish Sinha[c], Dr. Sanket Shah[d]

Abstract :

Aesthetic acceptance of the denture requires a variety of details to fall in place. A skilfully fabricated denture may not be accepted by the patient due its dead or artificial appearance once worn. The following review describes all the techniques to improve the aesthetics starting from the selection of teeth, arrangement, internal characterization of the denture base as well as external characterization of the denture .

Key Words : aesthetic appearance, selection, arrangement, characterization

INTRODUCTION

Beauty lies in the eyes of the beholder. The artistic ability of dentists vary from one to another. A teeth arrangement that is too perfect may not be ideal. Slight modifications in the denture without overlooking the basic guidelines can effectively convert a dead looking denture into a natural looking one.

Techniques for aesthetic enhancement

By selection of teeth

By replicating features of natural dentition in the denture

By internal tinting of the denture base

By external tinting of the denture base

TEETH SELECTION

Selection of the size and form of the teeth

DENTOGENIC CONCEPT (SPA FACTOR)[1,2]

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SEX:

Male patient: Sharp angles, squarish teeth, larger size of teeth than female patients,

Female patient: Rounded line angles, rounded countours of the teeth, smaller size

PERSONALITY:

Aggressive: wider teeth.

Delicate: rounded, smaller in size

AGE : slightly yellowish teeth in older patients due to the wearing away of the enamel layer of the tooth reflecting the underlying dentin.

SELECTION OF THE SHADE

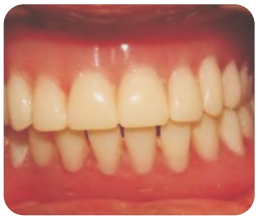
The chroma of canines is greater. Hence it should be atleast one shade darker than rest of the teeth.

Shade of the teeth should be in harmony with the pateint's skin (lighter skin- lighter shade), colour of the eyes and hair.

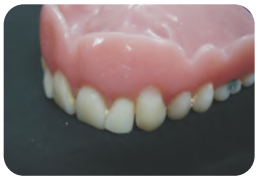
Squint test The colour which is most inconspicuous and appears to fade first from the view in comparison to other shades is most suitable for the patient.

Replicating features of natural dentition in the denture Prior to any characterization, a written consent signed by the patient is a must.

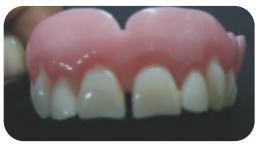
a. Male & patients with aggressive personality have incisal edge of the central and lateral incisors almost at the same level.



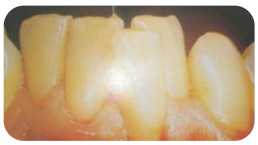
b. Females- laterals slightly elevated labially compared to centrals with slight overlapping on the central at the distal aspect and inclining the canine towards the palate.



c. Attrition: Mostly done on maxillary anterior teeth incisally 2-3mm in buccolingual direction.



d. Crowding in the lower anteriors centrals or laterals are slightly retroclined .The retroclined teeth should be at a higher level than the other anterior teeth.

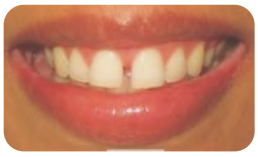


e. A midline diastema narrow at the base and broad at the incisal edges.

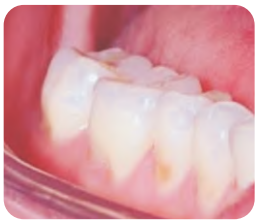
Should be 2-3 mm

>3 mm looks awkward

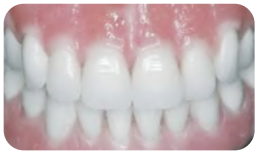
< 3 mm - entrapment of food



f. Cervical abrasion can be simulated as shown.



g. Texture of denture base: [stippling]:



It extends between the attached gingival and the mucolabial fold in the sulcus. Should not exceed more than 10 mm on the denture base.

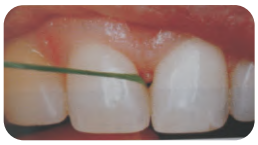
It can be incorporated by three methods

A. Brush method

B. Blow wax technique.

C. Plastic foam

h. Round papillae and margins:



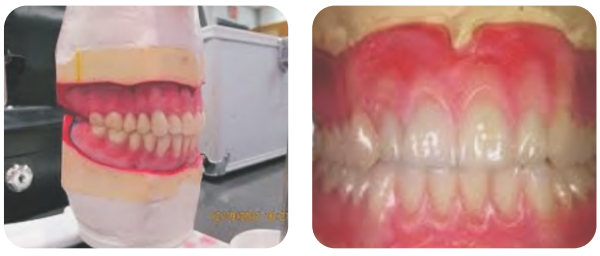
Slight rounding of the papillae and the margins can be done by using floss method where in the floss is passed between the contact point and the margins are contoured.

i. Use of gold occlusal surfaces on the teeth of prosthesis can contribute to its clinical success.

j. The concept of separateness - At the wax-up stage, the interproximal surfaces of the anterior teeth are routinely cleaned with dental floss, so that each tooth is seen as a separate and distinct entity in the completed denture.

k. Smile line-Every effort must be made to avoid the concave or reverse incisal line. The anterior teeth should have a curvature which corresponds to the lower lip during the patient's smile . Generally, younger women will have a curvaceous smile line, while older men may have a flatter arrangement.

l. Alveolar eminence: The labial flange should show a series of swellings corresponding to the alveolar eminencies over the roots of the teeth. These are most marked anteriorly and become progressively less marked in the pre-molar and



3. Intrinsic staining of the denture

molar region in both maxilla and mandible. In both, the canine eminence is most marked.

Variation in the colour of oral mucosa in different parts of the oral cavity

In staining the denture base to simulate natural tissue, three

factors must be considered in relation to actual oral conditions :

1. Variations of color are affected by the extent of vascularity within the tissue.

2. The thickness and density of the soft tissue act as secondary factors in altering tissue hues. Greater soft tissue thickness - deeper hues,

greater soft tissue density - lighter tissue.

3. The cellular components of a tissue will alter its color.

Commonly observed pattern of colours :

Deep (red) tones - found in the mucobuccal fold, frenula, soft palate, pharyngeal soft tissue adjacent to the tuberosities, incisive papilla, interdental papillae, and the larger rugae.

Pale (yellow) tones - found in root eminences and the hard palate.

Neutral (pink) tones -found on the lingual side of the lateral alveolar processes, and facially in the fan-shaped areas, between root eminences, that diverge toward the mucobuccal fold.

Cellular - nylon fibres replicating blood vessels

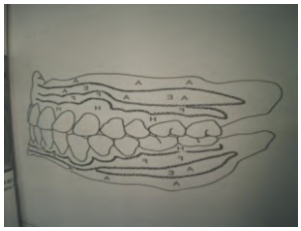
Technique for intrinsic tinting of the denture base[3]

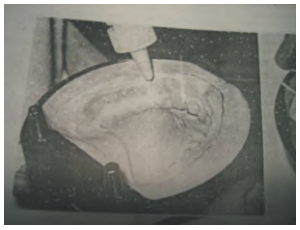
Usually five stains or resins are used for most of the dentures: these contains

1. basic color coded as H.[light pink as in attached gingival]
2. light red coded as F.
3. medium red coded as A.
4. Purple coded as E. use sparingly.
5. browncoded as B. used for heavy gingival pigmentation.

PROCEDURE

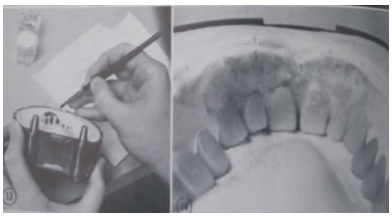
Flask and boil out the denture, paint it with tinfoil and allow





it to dry. Heat cured monomer is used to wet the resin.

Sift H resin over the facial aspect of the flasking stone in the region occupied by the attached gingival and saturate it with



monomer.

- Sift a light coat of F over the H and extend the F higher on the flange.
- Sift E sparingly on the area of the attached gingival

mucosa junction and saturate it with monomer. Do not over wet the resin or else it may pool in the lower gingival areas.

Sift A higher on the flanges to the borders of the denture. Use care since A is red.

- After tinting one side of the denture, complete the other side in the same manner.

Continually refer to the other side for comparison to avoid a pronounced difference in color and distribution of the tinting resin

- Place a plastic sheet over the tinted flask and allow it to set for 15 to 20 minutes before packing. If the denture is packed too soon the tinting resin can be squeezed out of the mold.
- The second method involves the use of brown and purple resins for those with pigmented oral tissues.

4. External tinting of the denture [4]

Previous color characterization techniques have generally involved applying gingival stains to the gingival surfaces in the flask after boil-out.

In the present technique, color characterization may be done by the dentist or technician after the denture has been processed. Custom staining can be done quickly and

requires the following armamentarium:

Denture tinting chart.

Soft tissue shade guide.

#6 camel hair brush.

Acrylic resin stains or shade modifiers in a variety of colors including red, brown and black.

Dappen dishes

Pressure pot or a light curing unit for curing the stains.

Newer, autopolymerizing and light-cured shade modifiers are cadmium-free and are preferred. When the the denture has been processed in the appropriate shade of denture base material, it is contoured and smoothed with an acrylic bur but not polished. Custom tinting is done at this time. An example of a typical procedure for a Caucasian is as follows:

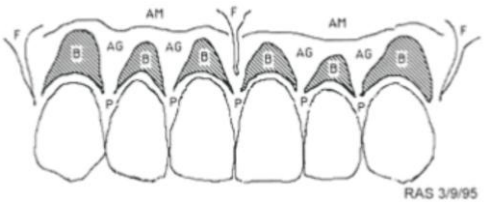
1. Place monomer and colored powders in different dappen dishes.

2. Brush monomer on surfaces to be tinted.

3. Wet brush and pick up increments of pale pink powder (or gingival toner) and apply to the blanched areas over root prominences.

4. Clean the brush and place red stain on the alvoelar mucosa and frenum attachments.

5. The unattached and attached gingiva and the papillae



remain as unstained denture base material.

6. Keep stains moist with the monomer during this time to prevent crystallization.

7.Cure the acrylic resin stains in the pressure pot or lightcuring unit according to the manufacturers instructions

Denture tissue tinting chart with areas to be tinted and shades selected.

AG = Attached Gingiva	shade light reddish pink
AM = Alveolar Mucosa	shade reddish pink
B = Blanched areas over roots	shade pale pink
F = Frenum Attachments	shade red stain
P = Papillae	shade light reddish pink

ADVANTAGES OF EXTERNAL TINTING

It consist of micro filled composite resin , can be applied in multilayered technique and can delivers unlimited possibilities for gingival reproduction

1 The clear coating provides a hard, high gloss which makes the polishing of dentures unnecessary.

2 Shades based on natural gingival tissue.

3 Lifelike esthetics.

4 Unlimited possibilities for gingival tissue reproduction.

5 Easy to polish and clean.

CONCLUSION

Functional and comfortable dentures can be fabricated with a good rate of success. However , characterized denture still remains a challenge. Characterization of the denture though a known concept and technique , its use is still limited to the patients demanding their lost natural features to be incorporated in the denture . Providing even minimal characteristics of the patient's natural appearance not only improves the acceptance of the prosthesis but also boosts the patient's confidence. This review describes a variety of techniques to improve the appearance of the patient and the acceptance of the prosthesis. For a characterized denture to be successfully fabricated, a good co-ordination between the dentist and the technician is an important pre-requisite. Long term practice of characterization can improve the judgement of the dentist as well.

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Frenectomy By Laser Therapy

Dr. Hiral Purani[a], Dr. Jigar Purani[b]

Abstract :

An aberrant frenal attachment may create periodontal, orthodontic, functional and aesthetic problems. Frenectomy by scalpel is the conventional method to remove such a frenum. The advent of laser has made possible to accomplish the same results as frenectomy with scalpel with some advantages. Here, two case reports are presented in which laser frenectomy is performed with its distinct advantages.

Key Words: Frenectomy, laser therapy

INTRODUCTION

A frenum is a fold of mucous membrane, usually with enclosed muscle fibres, that attaches the lips and cheeks to the alveolar mucosa and/or gingiva and underlying periosteum. A frenum can be a problem when it is attached close to the gingival margin. The proceedings of the World Workshop in Clinical Periodontics have outlined the rationale for the use of frenectomy.[1] The aberrant labial frenum can be associated with loss of papilla due to the tension from lip movement, recession, diastema, accumulation of plaque, interferes with proper tooth brushing.

Based on the extension of attachment of fibers, freni have been classified as:[2]

1. Mucosal- when the frenal fibers are attached upto mucogingival junction.
2. Gingival- when fibers are inserted within attached gingiva.
3. Papillary- when fibers are extending into interdental papilla.
4. Papilla penetrating- when the frenal fibers cross the alveolar process and extend upto palatine papilla.

The papilla and papilla penetrating types are usually believed to be pathological. Aberrant freni are detected visually by applying tension over it to see the movement of papillary tip or blanching produced due to ischaemia of the region.[3] In these cases, frenectomy is to be performed for function and aesthetics. The conventional frenectomy can be carried out surgically by scalpel and suturing in the following ways:

1) The simple excision technique
2) The Z plasty technique
3) A localized vestibuloplasty, with secondary epithelialization of the wound.

These techniques were standard and the only means to remove the abnormal frenum until recently. Now, the era of laser surgery is a leap forward in the modern technology that offers an alternative mode of treatment. Lasers can be used in the oral cavity for hard and soft tissues. The light energy from a laser may be reflected, transmitted, scattered or absorbed in a target tissue depending on the optical properties of the tissue.[4] The soft tissue periodontal surgeries like gingivectomy, frenectomy, growth removal can be done by diode laser, CO_2, Nd:YAG or Er:YAG laser. Diode laser between wavelength 800-1064nm is a semiconductor of gallium, aluminium and arsenide.

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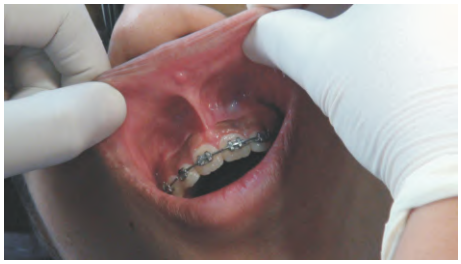
Diodes in this wavelength range have haemoglobin and pigments as its chromophores. Hence, they have a remarkable surgical cutting efficiency in well vascularised tissues. [5,6] Here, frenectomy was carried out by laser therapy to provide the benefits of laser over the traditional use of scalpel.

Case reports

In this study 2 female patients having high frenal attachments were treated by diode laser. Medical history was not significant. Written consents were signed by both the patients after explaining them the treatment.

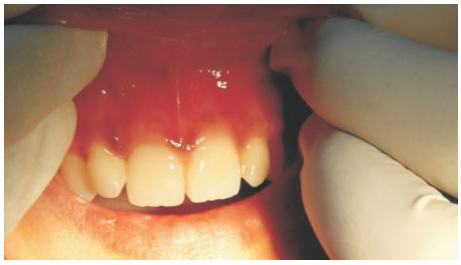
Case 1:

A 18 year old female patient was undergoing orthodontic treatment. After achieving the desired result, the orthodontist referred the patient for frenectomy. The frenum was papillary type, fibrous and with a nodule over the lip near its attachment. (Figure 1)



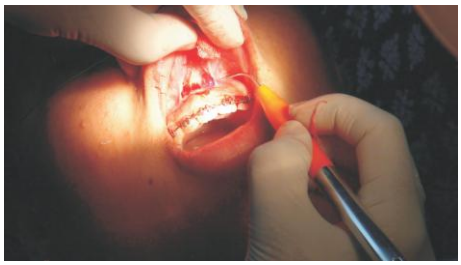
Case 2:

The patient was 23 year old and had just completed her orthodontic treatment and was referred by the orthodontist for frenectomy. The frenum was papillary type (Figure 5)

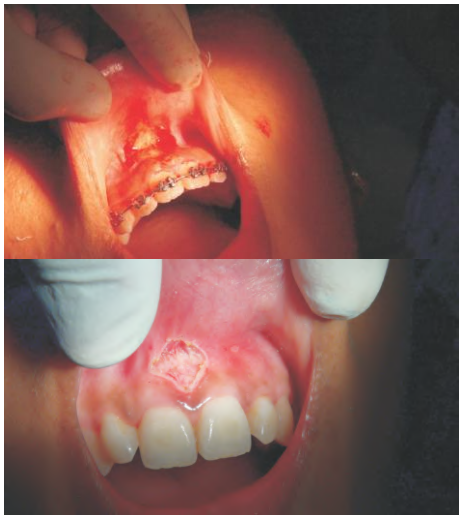


The diode laser device used in this study was the AMD Picasso Lite laser with 810nm wavelength and maximum power output of 2.5 W. The laser parameters set for this frenectomy procedure were glass fiber 300µm diameter disposable tip used in contact with the tissue at continuous wave mode. According to the manufacturer's instructions, the optical protective glasses with an optical density of 5+ were used during the procedure for the eye protection.

After topical application of local anaesthetic gel, only 0.5 ml. of anaesthesia was locally infiltrated just because the patients were anxious. The disposable tip of the laser fiber was initiated and the frenum was released at 1.0-1.2W. The upper lip was stretched outwards and upwards and the labial frenum distended for easy separation of the fibers from their underlying attachment. The laser fiber was applied horizontally and laterally to incise the frenum (Figure 2). The laser provided a bloodless field keeping the



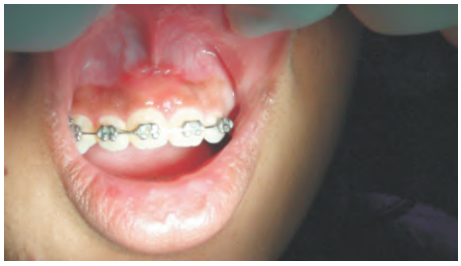
field of vision clear and accessible. Throughout the procedure, the high vacuum suction was constantly placed just besides the laser tip to reduce the heat buildup and thereby to prevent the thermal collateral damage. Also, the laser tip was wiped out periodically with wet gauze to remove the adherent tissue debris clinging over the tip. Moreover, the operative area was flushed to prevent the heat accumulation which can cause tissue charring and delayed healing at the wound site. The procedure was continued till all the vertical fibers were removed and periosteum was reached (Figure 3, Figure 6). No sutures or periodontal pack

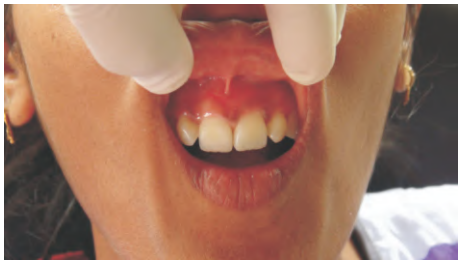


was placed after the procedure.

The complete procedure was carried out without patient discomfort or pain. There was sufficient coagulation in the cutting region. At the completion of the procedure, the patients were given routine postoperative instructions. The patients were specifically informed that during the laser healing a 'white soft scab' will appear for the first 7-10 days and not to misinterprete it as infection or not to rub that area. As lasers have antibacterial effect, infection is a very unlikely occurrence. The patients were reappointed at 3 days, 10 days and 1 month to evaluate the healing of the surgical area.

Postoperatively, both the patients reported of no pain except for a mild discomfort in case 1 for the first postoperative day that was controlled with analgesic drugs. After 3 days, the wounds showed fibrin layers. At the end of one month, the healing was uneventful and complete (Figure 4, Figure 7).





Discussion

Frenectomy is a common surgical procedure in dentistry. Here, in this study laser is being used to treat high frenal attachments focusing on its advantages over the conventional use of scalpel surgery. The surgical laser works on the principle of photothermal interaction with the tissue. In this process, the incident light is absorbed by the tissue and transformed into heat energy changing tissue structure.[7] Laser transmits energy to the cells causing warming, welding, coagulation, protein denaturation, vaporization and carbonization.[8] The amount of light absorbed depends on various factors like wavelength of laser radiation, power output at laser tip, optical properties and composition of the target tissue.[5] When using diode laser for frenectomies, several factors should be considered. The diode lasers are better absorbed by the pigments and vascularized tissue. [9] The freni may be at times typically thicker, fibrous tissue and may have little pigment. This means that it requires higher energies to ablate the tissue. Other wavelengths like Er:YAG lasers may ablate freni faster and can be used in non contact mode, but the disadvantage compared to the diode lasers is an increased risk of bleeding. Er:YAG are hard tissue lasers that are not well absorbed in hemoglobin as the soft tissue diode lasers and hence hemostasis can be a problem with these wavelengths. [10]

Diode lasers have several advantages when compared to monopolar electrosurgery units used for frenectomy procedure. The diodes cause less thermal collateral damage resulting in faster healing with less postoperative pain.[10] Many patients undergoing laser frenectomy require little or no postoperative medications. Also, it can be done only by using strong topical application of anaesthetics. [11] The patients in this study did not experience postoperative pain or swelling. Neither sutures nor periodontal dressing was required at the operative site, hence the postoperative visits are reduced. Pick also observed similar findings in his study.[12] Laser frenectomy is a simple, easy, fast and convenient technique for both the patient and the dentist. The laser application was found to be more effective and precise than scalpel surgery as it caused reduced bleeding, rapid postoperative hemostasis, less pain and discomfort to the patient and eliminated the need for sutures. The lack of need or little use of anaesthetics, elimination of sutures and pack, improved postoperative comfort and healing makes this technique particularly useful for young patients.[11,13]

Conclusion

Frenectomy via laser therapy is a promising treatment option offering significant advantages to the patient over the conventional techniques. In this fast paced life, lasers have made some of the dental surgeries more convenient, reducing the chairside time and postoperative care.

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Conservative Approach in Management of Regional Odontodysplasia

Dr. Nirav J. Parmar[a], Dr. Sunita A. Garg[b], Dr. Shashin J. Shah[c]



Abstract :

Regional odontodysplasia is an unusual, non-hereditary anomaly affecting a localized area of the dentition. It can affect the primary and permanent dentitions in the maxilla and mandible or both jaws. The etiology of this dental anomaly is uncertain. The affected teeth are often grossly malformed and develop abscess soon after eruption. Radiographically, the affected teeth show a "ghostlike" appearance. A case of RO in a 10 year-old male whose chief complaint was pain & pus discharge in relation to the right permanent maxillary central incisor is presented. The aim of treatment is to preserve the anomalous central incisor till the completion of jaw growth.

Key Words: Regional odontodysplasia, ghost teeth, amelogenesis imperfecta, odontogenesis imperfecta.

Introduction :

Regional odontodysplasia (RO) is an un-common, nonhereditary developmental anomaly affecting dental tissues derived from both mesoderm and ectoderm in a group of contiguous teeth [1]. The first report of this condition was published by McCall and Wald [2], but the term 'odontodysplasia' was introduced by Zegarelli et al [3]. Since that time, a number of cases have been described under a variety of names; such as localized arrested tooth development, regional odontodysplasia, ghost teeth, odontogenesis imperfecta, unilateral dental malformation, amelogenesis imperfecta, non-hereditary segmentalis and familial amelodentinal dysplasia [4]. Because this abnormality has a tendency to affect only one quadrant, RO is used to define it.

Clinically, RO can affect the primary and permanent dentition in either the maxilla, the mandible or both [5,6]. Though the condition most often affects only one quadrant, cases with bilateral or multiquadrant involvement have also been reported [5]. The maxillary teeth are affected more frequently than the mandibular, the maxillary central and lateral incisors and canines being more affected than the posterior teeth [7-9]. The etiology of RO is still unknown and such conditions as viral infections, local trauma, vascular defects, irradiation, metabolic disturbance, rhesus incompatibility and medications during pregnancy have been suggested as possible causes [1]. Some patients may also present with systemic anomalies, such as facial asymmetry [10].

The criteria for diagnosis of RO are primarily clinical and radiographic finding[11]. Clinical examination reveals affected teeth that are atypically shaped with surface pits and grooves and yellowish or brownish discoloration [1]. In the permanent dentition, teeth usually are not erupted or can be partially erupted with fibrous gingival tissue and swelling [7]. Radiographically, the anomalous teeth appear less opaque than unaffected teeth, and the demarcation between enamel and dentin is not distinct [1]. The pulp chambers and root canals are wide, giving the appearance of "ghost teeth."

The management of RO is somewhat controversial, although many clinicians prefer to extract the anomalous teeth as soon a diagnosis of RO is made,[6,12,13,] some prefer to retain them until skeletal growth is complete as long as they are free of infection [14,15]. In this article, a case of RO managed by a conservative approach is described.

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CASE REPORT :

A 10-year-old male patient came to govt. dental college & hospital with complain of pain & pus discharge in relation to right permanent maxillary central incisor. His prenatal, natal & postnatal, medical and family history were unremarkable. Extraoral examination revealed no extraoral swelling & facial deformity. Clinically, an intact right maxillary permanent central incisor was found to be yellowish-brown in color, smaller than normal in size with rough, irregular surface but not carious. Intraoral sinus with pus discharge and slight mobility was present. The maxillary right permanent first and second premolars were also grossly hypoplastic and discolored and had short crowns, but no dental abscess was seen clinically. Other teeth in both arches were normal. The periapical radiograph of the affected tooth demonstrated very thin dentin and enamel layers. The demarcation between them was not distinct and the pulp chamber was wide with a short root and open apex all of which gave rise to a 'ghost-like' appearance. Periapical radiolucency was present at the apex. (Fig. 1).

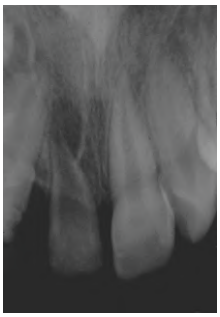
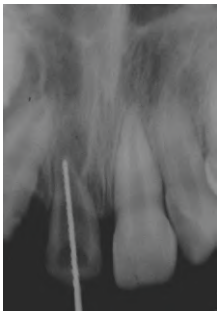


Fig.1

After adequate anesthesia, an access cavity was prepared and working length determined using a loosely fitting 70 no. K-file (Fig. 2). Gross debridement was done with K-files followed by thorough irrigation with sodium hypochlorite and saline. Intracanal medicament of calcium hydroxide with normal saline was kept for 15 days. On recall visit, calcium hydroxide was removed and root apex was sealed with mineral trioxide aggregate (ProRoot MTA, Dentsply) apical plug of 3 to 5 mm thickness. A modified spinal needle (16 gauge) was used to deliver MTA in the apical portion and was compacted using hand pluggers and verified by radiographs (Fig. 3). A sterile cotton pellet moistened with sterile water was placed in the canal and the access cavity was sealed with Cavit. After 2 days, the access cavity was reopened, cotton pellet removed and apical MTA plug was probed to check the complete setting . The remainder of the canal was filled with gutta-percha and root canal sealer using lateral condensation technique. A post obturation radiograph showed a well obturated canal (Fig. 4).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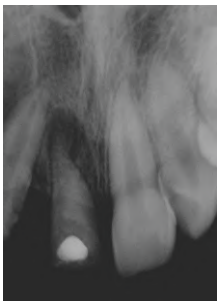
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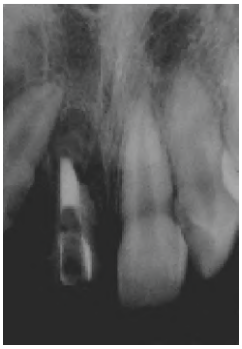
Fig.4

At the 6-month clinical examination, the tooth was free from symptoms such as pain, sinus tract, or tenderness to apical and gingival palpation & percussion. Radiographic examination revealed healing of periapical radiolucency (Fig. 5). Further follow-up of the patient was not possible after 6 months as patient did not come for follow up.

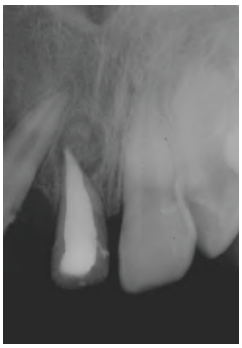
Fig.5

DISCUSSION :

In this case, success of conservative approach of treatment depended upon proper cleaning and disinfection of root canal system, followed by proper mixing, delivery & compaction of MTA to proper thickness. The aim of treatment should include improving function and reducing the psychological impact of early loss of tooth and facilitating normal jaw growth [1,16]. If a decision is made to retain the anomalous tooth, regular review is mandatory.

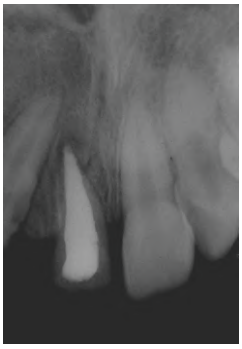
Fig.6

Ham et al. suggested that the combination of MTA and calcium hydroxide in apexification procedures may favourably influence the regeneration of the periodontium [17]. Aminoshariae et al. suggested that hand condensation resulted in better adaptation and fewer voids than ultrasonic compaction in open apex cases [18]. So in the present case, the MTA apical plug was placed by using modified spinal

needle (16 gauge) and compacted with hand pluggers. Some authors have postulated that possible leakage of MTA could be influenced by the thickness of the apical plug. de Leimburg et al. reported that the orthograde use of MTA provided an adequate seal against bacterial infiltration regardless of the thickness of the apical barrier [19]. In the present case, apical plug of 3mm to 5mm was placed and resulted into good healing.

At 6-month follow-up, the tooth was free from symptoms such as pain, sinus tract, or tenderness to apical and gingival palpation & percussion. Radiographically tooth revealed healing of periapical radiolucency. But endodontic treatment carried out in this case cannot be considered optimal because the esthetics and function of the patient's dentition were not fully restored.

In cases where patients prefer not to retain anomalous teeth, extraction and replacement with a removable prosthesis should be considered[20]. Autotrans plantation with sound supernumerary teeth from unaffected quadrants can also be a viable option,[16,21] but this is limited by the availability of suitable donor tooth.

CONCLUSION :

The long-term prognosis for the anomalous central incisor is poor because of the poorly developed coronal and radicular structures. Extraction of this tooth will be necessary when the patient's jaw and skeletal growth is completed. Definative rehabilitation may consist of dental implants, fixed or removable prostheses or a combination of these [16].

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Laser in Dentistry

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Abstract :

Lasers were introduced into the field of advanced dentistry to overcome some of the drawbacks seen in conventional methods of dental procedures.

Presently, wide varieties of procedures are carried out using lasers. The aim of this review is to describe the application of lasers in dental hard and soft tissue procedures. Lasers are found to be effective in gingivectomy, frenectomy, vestibuloplasty, operculectomy, excisional biopsy, crown lengthening, cavity preparation, caries removal, restoration removal, etching, and treatment of dentinal sensitivity, caries prevention and teeth whitening.

Key Words: laser, dental hard tissue, adhesive dentistry

Introduction :

The word LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. All dental lasers exert their desired clinical effect on a patient's target tissue by a process called *absorption.*[1].

Dental lasers function by producing waves of photons (quanta of light) that are specific to each laser wavelength.[2] This photonic absorption within the target tissue results in an intracellular and/or intercellular change to produce the desired result. Dental lasers can be divided into three basic groups: soft tissue lasers, hard tissue lasers, and nonsurgical devices such as diagnostic/composite and photodisinfection lasers.

Classification of Lasers:

Lasers can be classified according its spectrum of light, material used, and hardness etc

Lasers are also classified as soft lasers and hard lasers.

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Soft lasers are of cold (athermic) energy emitted as wavelengths; it stimulate cellular activity. These soft lasers utilize diodes and researchers claim that these lasers can aid healing of the tissue, decreases inflammation, edema, and pain.[3] Clinical application includes healing of localized osteitis, healing of aphthous ulcers, reduction of pain, and treatment of gingivitis.[4]

The current soft lasers in clinical use are the:

Helium-neon (He-N) at 632.8 nm (red, visible).

Gallium- arsenide (Ga-As) at 830 nm (infra-red, invisible).

Hard lasers (surgical) can cut both soft and hard tissues.

These lasers transmit their energy through a flexible fiber optic cable.

Types clinically used:

Argon lasers (Ar) at 488 to 514 nm

Carbon-dioxide lasers (CO2) at 10.6 micro-meter

Neodymium-doped yttrium aluminum garnet (Nd:YAG) at 1.064 micrometer.

Holmiumyttrium - aluminum-garnet (Ho:YAG) at 2.1 micro-meter.

Erbium,chromiummyttrium - slenium - gallium -garnet (Er,Cr:YSGG) at 2.78 micro-meter.

Neodymiummyttrium - aluminum - perovskite (Nd:YAP) at 1,340 nm

Classification according to light spectrum[4]

UV Light 100 nm	400 nm Not used in dentistry
Visible light	400 nm to 750 nm Most commonly used in dentistry (Argon & Diagnodent Lasers)
Infrared light	750 nm to 10000 nm Most dental lasers are in this spectrum

Classification according to material used

Gas	Liquid	Solid
Carbon dioxide	Not so far in clinical use	Diodes
rgon		Nd:YAG,
		Er:YAG,
		Er:Cr:YSGG,
		Ho :YAG

Argon lasers are those lasers in blue-green visible spectrum. Argon lasers have affinity for darker colored tissues and also have a high affinity for hemoglobin, making them excellent for coagulation.

Argon lasers also have ability to cure composite resin.

Argon lasers can detect incipient caries.

CO2 laser was developed by Patel et al. in 1964.[5]

CO2 lasers works in non-contact mode.

CO2 laser has an affinity for wet tissue regardless of tissue color. As long as tissues are wet CO2 laser are absorbed into the area. This means they are high absorbed in oral mucosa, which has more than 75 to 90% water about 98% of energy is converted to heat and absorbed at the tissue surface with little scatter or penetration.[6]

One of the limitation of this laser is the penetration depth is approximately 0.2 to 0.3 mm. CO2 lasers causes rapid rise in the intra-cellular temperature and pressure leads to cellular rupture as well as release of vapor and cellular debris, called the " laser Plume".

Heat induced cracking of the root surface is a common observation when using CO2 laser

CO2 used in a low power and pulsed waveform causes minimal damage. CO2 lasers have limited application in subgingival periodontal therapy.[7]

Nd:YAG laser was introduced by Geusic in 1964.

The light beam is transmitted along extremely flexible fiber optic cables ranging in size from 200 to 600 microns. This allows access to parts of the oral cavity including root canals. This laser is used with a guiding beam helium-neon and contact mode allowing tactic feedback. It renders all soft tissue procedures potentially sterile. Absorbance of hemoglobin is nearly 80 percent, therefore for most techniques; a relatively bloodless field can be accomplished

Erbium:YAG laser: In 1997 with FDA safety clearance erbium: YAG laser have been practiced on hard tissue like enamel, cementum, bone. Er:YAG laser has not been extensively used for the soft tissue applications. Er:YAG laser has a wavelength of 2,940 nm, which is said to be ideal for absorption by hydroxyapatite crystals and water, making it more efficient in ablating enamel, and dentine. This wavelength causes water to evaporate into steam, being irradiated resulting micro-explosion of the hard tissue. Water spray is used to wet the surface during laser radiation to achieve maximum efficiency of tissue removal with minimum heat generation. The surface left is like acid etched, which enhances the bond strength to restorations. Minimum heat damage has been reported when used on dental hard tissue at appropriate power densities.[8]

Er:Cr:YSGG laser (Erbium: Chromium: YSGG) or water-laser or Bio-laser , works by Hydro-kinetic tissue cutting system using laser power to energize water for the use on hard and soft tissues. The laser energy excites the fiber and encounters a mist of water droplets which absorbs energy. These droplets are instantly reduced to particulates and propelled with such force that they are capable to cut hydroxyl-apatite crystals of enamel and the osseous skeleton of the bone. The energized water removes hard tissue with great efficiency. When sapphire tip is in contact

the energy is in focus and will cut faster, and when out of touch, defocused the cutting will be slower. The laser energy is delivered through a flexible fiber optic system.

Diode laser :

Indium-gallium-arsenide-phosphide-InGaAsP (diode); Gallium-aluminum-

arsenide-GaAlAs (diode); Gallium-arsenide -GaAs(diode).

It has wavelength range of 635 to 950 nm, utilizing flexible quartz fiber; it is absorbed by pigmentation of the soft tissue. Thereby making diode laser an excellent hemostatic agent. Diode is used for soft tissue removal in contact mode, giving tactile sensation similar to electro cautery. The power output used is generally 2 to 10 W, and can be either pulsed or continuous mode. Its effect on the tissue is similar to Nd:YAG laser, with less thermal effects on the deeper tissues.[9]

Clinical laser applications

Metal or diamond instruments are used in conventional dentistry to drill, cut, or abrade hard and soft tissues.

Dental lasers can be used to cut, incise, and ablate hard and soft tissues. The properties of laser light—such as selective absorption, coagulation, sterilization, and stimulatory effects on vital structures—make lasers the treatment of choice in certain clinical procedures.

Proper clinical technique is very important when using laser. It is recommended that the clinician use proper magnification and illumination to assess the treatment's progress and determine that photothermal ablation is occurring. A definitive color change is observed at the initial moment of tissue ablation; at that point, the clinician should move the laser tip in a slow and deliberate "paint brushing" motion, always evaluating the laser/tissue interaction to obtain the optimal result. Many new laser users make the common error of using a fast and constant painting motion and moving the beam too quickly; this improper technique will not allow proper ablation to occur.[10]

Soft tissue lasers

It is important to understand that lasers function with an "end cutting" action (that is, laser energy is emitted from the end of the laser), while most other dental instruments are "side cutting," with the cutting edges or abrasive surfaces located on the lateral surface. Although most laser soft tissue treatments heal by secondary intention, the postoperative course usually is uneventful. Most laser excisional or incisional procedures are accomplished at 100°C, where vaporization of intra and extracellular water causes ablation or removes biological tissue.[11] Clinicians must be wary of the heat generated within tissues during a procedure. If the tissue temperature exceeds 200°C during a lasing procedure, carbonization and irreversible tissue necrosis will occur. This adverse consequence can be avoided completely by using the lowest power setting necessary to achieve the desired treatment goal.

The soft tissue indications for the clinical use of lasers, include anterior gingival esthetic recontouring, gingivectomy/gingivoplasty (for crown lengthening procedures), operculectomy, removal of epuli, incisions when laying a flap, incision and drainage procedures, frenectomy, vestibuloplasty, coagulation of extraction sites, treatment of herpetic and recurrent aphthous ulcer lesions, uncovering of an implant, pre-impression sulcular retraction, and ablation of an intraosseous dental pathology (such as a granuloma or an abscess).[12]

Other excisional laser procedures involve the removal of soft tissue targets that may appear as benign lesions (such as fibromas or papillomas) on the lip, tongue, buccal mucosa, or palatal area; the removal of coronal pulp as an adjunct to root canal therapy; excisional biopsy; and sulcular debridement.

Diode (810 nm, 940 nm, 980 nm, 1,064 nm), Nd:YAG (1,064 nm),

CO2(10,600 nm), Er:YAG (2,940nm), Er,Cr:YSGG (2,780 nm), and potassium-titanyl-phosphate (KTP) (532 nm) lasers are the wavelengths used most commonly for soft tissue procedures.

A diode laser can be used for clinical scenarios in which an aberrant frenum pull causes recession and a loss of attached gingiva.

Hard tissue lasers

At present, erbium lasers are the only hard tissue laser wavelengths available commercially. The main chromophore for erbium lasers is water, although they also are well absorbed in carbonated hydroxyapatite, a component of natural tooth structure and bone. These inherent absorption qualities allow erbium lasers to ablate tooth and bone. Erbium lasers are unique in that they are the only lasers that can cut both hard and soft tissues. The erbium laser's ability to remove composite restorations is due to their photonic absorption in the water that exists within all composite restorations. Hard tissue ablation results from micro evaporative expansive events that occur within the target due to an extremely rapid buildup of heat and spontaneous evaporation of the available water content. This process also is referred to as a *thermomechanical effect* due to the pressure buildup involved. This type of laser/tissue interaction results in a characteristic popping sound.

Etching

Laser etching has been evaluated as an alternative to acid etching of enamel and dentine. The Er: YAG laser produces micro-explosions during hard tissue ablation that result in microscopic and macroscopic irregularities. These microirregularities make the enamel surface microretentive and may offer a mechanism of adhesion without acid-etching. However, it has been shown that adhesion to dental hard tissues after Er: YAG laser etching is inferior to that obtained after conventional acid etching. [13]

Treatment of dentinal hypersensitivity

Dentinal hypersensitivity is one of the most common complaints in dental clinical practice.

A comparison of the desensitising effects of an Er: YAG laser with those of a conventional desensitising system on cervically exposed hypersensitive dentine showed that desensitizing of hypersensitive dentine with an Er: YAG laser is effective, and the maintenance of a positive result is more prolonged than with other agents.[14]

Bleaching

The objective of laser bleaching is to achieve an effective power bleaching process using the most efficient energy source, while avoiding any adverse effects .[15] Power bleaching has its origin in the use of high-intensity light to raise the temperature of hydrogen peroxide, accelerating the chemical process of bleaching. The FDA approved standards for tooth whitening has cleared three dental laser wavelengths: argon, CO2 and the most recent 980-nm GaAIAs diode.

Benefits and drawbacks of dental lasers

One of the main advantage of using dental lasers is the ability to selectively and precisely interact with diseased tissues. Lasers also allow the clinician to reduce the amount of bacteria and other pathogens in the surgical field and, in the case of soft-tissue procedures, achieve good hemostasis with the reduced need for sutures. The hard-tissue laser devices can selectively remove diseased tooth structure because a carious lesion has a much higher water content than healthy tissue, and water is the primary absorber of that wavelength of laser energy. These same devices show advantages over conventional high-speed handpiece interaction of the tooth surface; for example, lased dentin has no smear layer and the cavity preparation has been disinfected. Osseous tissue removal and contouring proceed easily with the Erbium family of instruments.

There are some disadvantages to the current dental laser instruments. They are relatively high cost and require training. Because a majority of dental instruments are both side- and end-cutting, a modification of clinical technique will be required.

Accessibility to the surgical area can sometimes be a problem with the existing delivery system, and the clinician must prevent overheating the tissue and guard against the possibility of surgically produced air embolisms that could be produced by excessive pressure of the air and water spray used during the procedure. One additional drawback of the erbium family of lasers is the inability to remove metallic restorations.

Summary

It is most important for the dental practitioner to become very familiar with the principles, have clinical experience, and receive proper laser training. Then he or she can choose the proper laser(s) for the intended clinical application. Although there is some overlap of the type of tissue interaction, each wavelength has specific qualities that will accomplish a specific treatment objective. Laser energy requires some procedures to be performed much differently than with conventional instrumentation, but the indications for laser use continue to expand and further benefit patient care.

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