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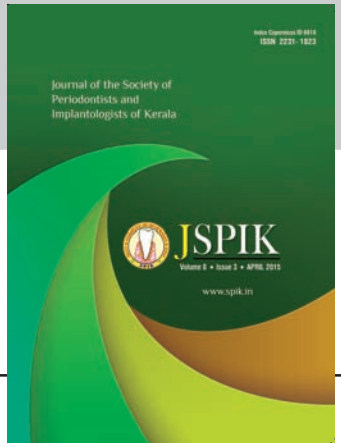

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President's message

We have come to the fag end of the Society year. Looking back , I am satisfied that we could do justice to our events calendar planned for the year 2014-15. An attempt was made to reduce the no. of programmes,sticking on to one scientific programme , Mid term conference and Annual conference. The scientific programme held at Pushpagiri on Periodontal plastic surgery was a success thanks to the record participation for any SPIK event till date. The Mid term conference was held for two days for the first time . The Kottayam conference was event packed and the highlights were the novel programmes like Speak out, symposium and Final frontier. Hope the same things will continue in the future as well. The two day format for the mid term conference looks a good package especially for the post graduate students . We are taking adequate care about the continuing education of our associate emebers , but we should keep an exclusive scientific programme for the life members as a regular fixture.

As a founder member of SPIK I am worried at the poor turnout of members for SPIK programmes. The people who are regularly attending are the same familiar faces. Eventhough our membership strength is now 250 odd it is saddening to note that only 20 to 25% of people attend our programmes regularly. It is definitely a matter of concern and it is the right time to do an introspection and feedback assessment to find out ways to attract more people. SPIK is currently the only platform in the state with a pan kerala presence. It definitely has been a provider of information about the happenings in the field from the global scenario . It is capable of catering to the scientific and social needs of its members and the members should recognize this very fact.

I take this opportunity to thank all the fellow members for their participation encouragement and support given for all the SPIK activities during the current association year. I do consider it as an honour to be at the helm of affairs of this esteemed society. I wish that the society scale greater heights in future through the dedicated efforts of its leaders and members.

Perio is thrilling

Dr Baiju R M
President - SPIK

From the editors desk

A periodontal " PROFESSIONAL"

There must be a clear understanding of what an individual must do to remain a professional. Few things I would like you to stress upon is.

If one is to perform the duties of a periodontist competently then there is an overwhelming need to keep up with all aspects of professional practice. This will necessitate updating one's existing knowledge and skills, as well as acquiring new ones. Lifelong learning is part of our professional obligation and should not be a passive routine of attending a few continuing education courses. Lifelong learning, in a professional context, means taking responsibility for your own education by taking advantage of all available resources such as professional journals, attending meetings and courses, and even participating in live discussions.

Being a professional requires one to guard oneself against conflicts of interest. In our profession the most obvious conflicting interest we face is to put our personal interests ahead of our patients. Where one derives income from their professional activities this will always be a dilemma. This issue becomes even more complex when professionals are pressured to give priority to the interests of third parties, such as corporate clinics. In recent times it seems such pressures have reached plague proportions. As a profession, and as professionals, it would seem that if we wish to maintain our profession and professionalism in the good light we should perform only procedures what we believe in and justify that for the patient.

It is also the professional responsibility of all members of a profession to further the profession and enable it to grow and survive well beyond our working years. This means being involved in the profession, giving something back to the profession and always maintaining professional standards.

Now the question you need to answer to is are you a real professional or a person doing trade. A point to justify your role in the profession.

As we enter a new year of SPIK, i thank all the professional leaders of SPIK whom I was associated with in the last two years of my duty as the editor of JSPIK. To keep the flag flying, I hope new thinking , new faces and new strategies are brought to drive the periodontal profession forward.....

Yours as always in SPIK

Dr Mahesh Narayanan
editorspik@gmail.com

Secretary's Message

Dear Members,

Warm greetings to all the spik members

At the outset let me thank all the Spik Members for the wonderful participation and cooperation extended for the conduct of programs during the year 2014-15.

The mid term conference in kottayam was a grand success with respect to the innovative content of the programme as well as participation from post graduate students. It was first time that the midterm conference was conducted for two days.

Let me congratulate the Editor for bringing about the Third issue. As we are aware the journal has always maintained the quality of articles which also includes color photographs with definite increase in the number of articles per issue.

This year has been special because of the tremendous increase in the membership of associate members. We have also conducted an essay competition as well as orientation program for practical examination for the students.

The coming months to follow we would further like to increase the membership strength as well as implement new ideas and innovations to improve the scientific activity of SPIK.

Looking forward for a fabulous annual conference and get-together on April 25, 26 at Kannur.

Jai Spik

Dr. Anil Melath
Secretary, SPIK

Ligaplants –a therapeutic modality on the horizon

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Sreedevi Krishanan G[1]
Raseena Beevi[2]
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ABSTRACT

Though the fields of regenerative dentistry and tissue engineering have undergone significant advancements, yet its application to the field of implant-dentistry is lacking; in the sense that presently the implants are being placed with the aim of attaining osseointegration without giving consideration to the regeneration of periodontium around the implant. The following article reveals the clinical beneits of such periodontio-integrated implants and reviews the relevant scientific proofs

Key Words: Implant, osseointegration, periodontium, tissue engineering.

INTRODUCTION

Implants and only implants seem to be the norm of the day. The boom in implant dentistry is attributed to a combination of various reasons; prolonged life span of aging individuals, failures associated with removable and fixed prostheses, advantages, and predictable outcomes associated with use of implants. Implants seem to be the obvious solution and titanium has been recognized as biocompatible alternative in replacing missing teeth. They are retained in the oral cavity by virtue of their direct structural and functional bond formation between bone and titanium, i.e., osseointegration, which is pivotal for clinical success.

However, sometimes the absence of movement of the implant denture, can cause build up of forces and drastically harm the quality and quantity of the surrounding alveolar bone, implant as well as the TMJ. Over the years, many strategies have been explored to improve the osseointegrative property of the implant, be it the surface modifications to improve the mechanical, physical, and chemical characteristics of the implant, by modifying the shape and design,[1] altered surface topography to control cell behavior, nanostructured surface coatings or the addition of biomimetics (growth factors) to the implant surface.[2]

LIGAPLANTS

The field of oral and periodontal regenerative medicine has recently undergone significant advancements in restoring as close as possible the architecture and function of lost structures. However, to date, there has been a major "disconnection" between the principles of periodontal regeneration and oral implant osseointegration: the presence of a periodontal ligament to allow for a more dynamic role beyond the functionally ankylosed implant.[3] The passive threshold level of implants determined by the application of an external stimulus has been found to be 50 times higher than that of natural teeth; which means that patients with osseointegrated implants will subjectively feel tangible sensation only when a force greater than that required to evoke sensation in natural teeth is applied. Therefore, an innovative approach is mandatory to create "periodontio-integrated implants" i.e., an implant suspended in the socket through periodontal ligament as opposed to functionally ankylosed osseointegrated implants.[4]

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Authorand year	Material and Method	Animal/ human study	Conclusion
Gault et al.(2010),[6]	Cells isolated from PDL and cultured in a bioreactor on titanium pins and then implanted in enlarged dental alveolae in dogs and humans	Human and animal study	Ligament-anchored implants, have potential advantages over osseointegrated implants
RinaldiandArana-Chavez(2010)[7]	Titanium mini-implant placed between the buccal roots of the mandibular first molar of 24 adult rats. Ultrastructural analysis done after 21, 30, 45, 60, 90, and 120 days of implantation	Animal study	Titanium surface through its well-known biocompatibility exerts an effect on the periodontal ligament to lay down a cementum-like layer on the implant surface
Lin et al.(2011)[8]	Test site: PDL derived autologous DPCs seeded implants placed in the molar region of the rat model.Control site: Non-cellseeded implants placed in the molar region of the rat	Animal study	Suggested the potential to replace missing teeth in humans with dental implants augmented with autologouscell-derived bioengineered periodontal tissues
Kano et al.(2012)[9]	HA–/OCL–, HA+/OCL–, and HA+/OCL+ immediately implanted into extracted tooth sockets withremaining PDL of rat molar model and the regeneration of PDL examined histomorpho metrically and histologically	Animal study	The remaining PDL tissue around extracted sockets has the ability to regenerate bone and PDL-like tissueson HA-coated tooth-shaped implants. Occlusal loads to the HA-coated implants may induce regeneration of PDLlike tissue in the peri-implant

HA: Hydroxyapatite, TA: Titanium alloy, DPCs: Dental progenitor cells, HA–/OCL–: Non-HA-coated without occlusion, HA+/OCL–: HA-coated without occlusion, HA+/OCL+: HA-coated with occlusion,

Though implants are an ideal way to replace a missing tooth, still lacking is the presence of the periodontal ligament, as in the natural teeth. This soft, richly vascular, and cellular connective tissue permits forces, elicited during masticatory function and other contact movements to be distributed to the alveolar process via the alveolar bone proper. It acts like a shock absorber, giving the tooth some movement in the socket. It also provides proprioception. The periodontal ligament also has an important interaction with the adjacent bone, playing the role of the periosteum, at the bone side facing the root. It homes vital cells such as osteoclasts, osteoblasts, fibroblasts, cementoblasts, cementoclasts, and most importantly,

Osseointegrated implants versus Periodontally integrated

OSSEOINTEGRATED IMPLANTS	LIGAPLANTS
Localized bone loss- Excessive stress that accumulate at the crestal region of the implants leads to bone loss at this region [10]	dissipates these forces[11]
diminished ability of dental implants to adapt to occlusal trauma can be attributed to this lack of periodontal proprioceptive mechanism,[12]	sensitive proprioceptive mechanism and is therefore capable of detecting and responding to a wide range of forces applied to the teeth.
connecting teeth to osseointegrated implants presents a biomechanical challenge due to the differential support and mobility provided by the implant and the tooth13	when tooth-implant supported restorationswould be fabricated using support from periodontiointegrated implants higher success rates can be expected due to similar resilience of tissues supporting teeth and implants
contraindicated in growing patients14	successfully place implants in patientsundergoing craniofacial/skeletal growth process,
behave as an ankylosed element	move them orthodontically
the tissues around implants are more susceptible to plaque-associated infections that spread into the alveolar bone, primarily due to the lack of a periodontal ligament, making them more prone to bone loss15	provide better defensive capacity, also enhance repair and regeneration of bone defects in their vicinity

the undifferentiated mesenchymal stem cells. These cells are all important in the dynamic relationship between the tooth and the bone

As early as 1990, Buser et al.[5] showed that titanium dental implants when placed in contact with retained root tips, the periodontal ligament of these roots served as a source for cells which could populate the implant surface during healing. Now, tissue engineering has opened a new vista in periodontal regeneration and more so in the treatment of dental implants. From various scaffolds to matrices, all have proved their ability to regenerate the entire periodontium

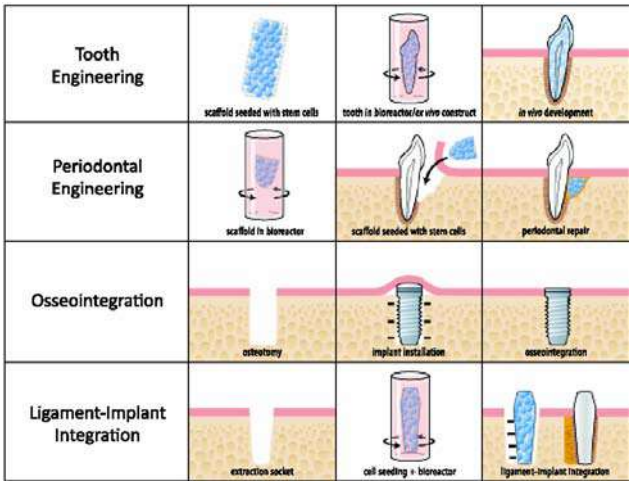
Recent Studies demonstrating the feasibility of formation of periodontium around dentalimplants

Fig. 1. Stem cell-based therapies in the bioengineering of teeth, periodontium and alveolar bone structures. In the situation of the formation of a tooth–implant interface, periodontal ligament stem cells offer the potential to form tooth–ligament–bone interfacial complexes[5]

Limitations of ligaplants

- significant unpredictability in the human clinical situation.
- labour-intensive
- requires extensive regulatory requirements regarding cell procurement, confirmation of cell safety
- The costs and time required is significant

Models for cell based engineering of tooth and implant supporting tissue constructs



CONCLUSION

Although it has been revealed that generating a periodontal-like tissue around implants is possible, still a predictable and feasible method for producing dental implants with periodontal-like ligament has not been innovated. A major concern being the rational application of stem cell based tissue-engineering technology in clinical practice. Besides, the costs and time required from a practical standpoint for such tissue engineering applications is significant. Yet, this revolutionary approach to develop periodontio-integrated implants; however, opens up exciting possibilities for both periodontologists and oral implantologists and offers many interesting possibilities of utilizing ready-made, off-the-shelf biological tooth replacements that could be delivered to serve as hybrid-material-living oral implants.[16]

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Ergonomics in dental practice

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Sandhya .T.Nair[2]
Raseena Beevi[3]
Presanthila Janam[4]

ABSTRACT

Dentistry is a profession that generally produces muscular pain and soreness, they are usually harmless and slow to appear, consequently, the symptoms are usually ignored until they become chronic and permanent lesions are present. Dental profession is not immune from Musculo skeletal disorders (MSDs) or cumulative trauma disorders (CTD). Ergonomics is the science of fitting the task to human capabilities and limitation in order to improve work place safety and productivity.. Proper ergonomic design is necessary to prevent repetitive strain injuries (RSJ), which can develop over time and can lead to long term disability. This review gives a bird's eye view about the basics of ergonomics, positioning, viewing, handling ourselves away from hazards and musculoskeletal disorders.

Key words: Ergonomics, MSD, CTD

INTRODUCTION:

Dentistry is a social interaction between helper and recipient in their limited job setting and with personal characteristics. A healthy dentist is one of the most important component in a successful dental practice. It is estimated that more than half of practitioners have some kind of painful musculoskeletal disorder that is work related. Dental professionals often develop musculoskeletal problems, which are related to sub-optimal work-environment ergonomics that might be responsible for improper sitting postures and movements causing unnecessary musculoskeletal loading, discomfort, and fatigue[2]. Literature suggests that the prevalence of skeletal or muscular pain in dentists, dental hygienists and dental students ranges from 93% to 64%. The most prevalent regions for pain in dentists have been shown to be the back (36.3%-60.1%) and neck (19.5-80%)[3]. Although the causes of any particular case of a MSD are exceedingly difficult to identify with complete accuracy, certain risk factors are typically discussed in the field of ergonomic studies.

Recently, "Ergonomics" has become a popular term. The term has been used with most professions but increasingly in the dental profession. The word 'Ergonomics' was derived from the Greek word: Ergo' which means work; and 'nomos' meaning natural laws. It is the science of fitting the job settings conducive to the worker. In simple terminology, Ergonomics is a way to work smarter- nut harder, by designing tools, equipment, work stations and tasks to fit the job to the worker- NOT the worker to the job. Proper ergonomic design is necessary to prevent repetitive strain injuries (RSI), which can develop over time and can lead to long term disability[4].

MUSCULOSKELETAL DISORDERS:

The World Health Organization defines an MSD as "a disorder of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event (e.g., slips or falls). These disorders are considered to be work-related when the work environment and the performance of work contribute significantly, but are only one of a number of factors contributing to the causation of a

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multi factorial disease ."[5]

Cumulative trauma disorders (CTDs) are health disorders arising from repeated biomechanical stress to the hands, wrist, elbows, shoulders, neck and back[6].

Most common CTDs are carpal tunnel syndrome and Low back pain." The common signs, symptoms and risk factors of MSD are:

Some Symptoms of MSDs:

- Excessive fatigue in the shoulders and neck
- Tingling, burning sensation in arms
- Weak grip. cramping of hands
- Numbness in fingers and hands
- Clumsiness and dropping of objects
- Hypersensitivity in hands and fingers

Signs of MSDs:

- Decreased range of motion
- Loss of normal sensation
- Decreased grip strength
- Loss of normal movement
- Loss of co-ordination

With specific reference to dentistry, the risk factors include: stress, poor flexibility, improper positioning, in frequent breaks, repetitive movements, weak postural muscles, prolonged awkward postures and improper adjustment of equipment.

MECHANISMS MSDS IN DENTISTRY:

Prolonged Static Postures (PSPs): When the human body is subjected repeatedly to PSPs, it can initiate a series of events that may result in pain, injury or a careerending MSD.

Muscle Ischemia/Necrosis and Imbalances: During treatment, operators strive to maintain a neutral, balanced posture and find themselves in sustained awkward postures. These postures often lead to stressed and shortened muscles which can become ischemic and painful, exerting asymmetrical forces that can cause misalignment of the spinal column[7].

Hypo-mobile Joints: During periods of PSPs or when joints are restricted due to muscle contractions, synovial fluid production is reduced and joint hypo mobility may result.

Spinal Disc Herniation and Degeneration: In unsupported sitting, pressure in the lumbar spinal discs increases. During forward flexion and rotation, the pressure increases further and makes the spine & disc vulnerable to injury .

Neck and Shoulder Injury: Repetitive neck movements and continuous arm and hand movements affecting the neck and shoulder demonstrate significant associations with neck MSDs.

Carpal-Tunnel Syndrome (CTS): It has been associated with both repetitive work and forceful work. Symptoms can appear from any activity causing prolonged and increased pressure (passive or active) in the carpal canal.[8]

SITTING POSTURE

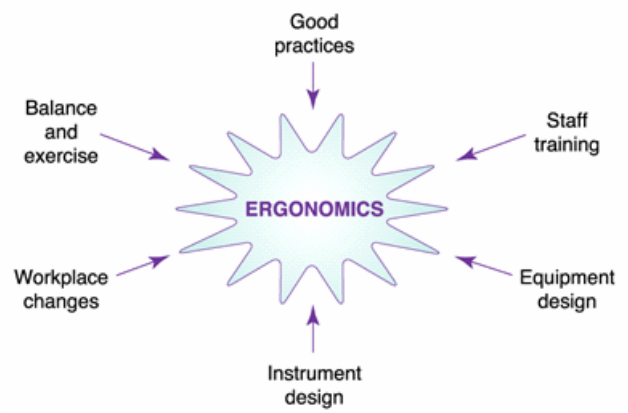
Human spine has four natural curves; cervical lordosis, thoracic kyphosis, lumbar lordosis and sacral kyphosis . When sitting unsupported frequent posture in dentistry the lumbar lordosis flattens. The bony infrastructure provides little support to the spine, which now is hanging on the muscles, ligaments and connective tissue at the back of the spine, causing tension in these structures. lschemia can ensue, leading to low back strain and trigger points. Maintaining the cervical lordosis in the proper position is equally important.

Forward-head postures are common among dentists, due to years of poor posture involving holding the neck and head in an unbalanced forward position to gain better visibility during treatment. In this posture, the vertebrae no longer can support the spine properly, and the muscles of the cervical and upper thoracic spine must contract constantly to support the weight of the head in the forward posture. This can result in a pain pattern, which often is referred to as tension neck syndrome. This syndrome can cause headaches and chronic pain in the neck, shoulders and inter-scapular muscles, and it occasionally can radiate pain into the arms[9].

The best way to reduce pressure in the back is to be in a standing position. However, there are times when the dentist needs to sit. When sitting the main part of the body weight is transferred to the scat. Some weight is also transferred to the floor, back rest and arm rests.

Where the weight is transferred is the key to a good seat design.

When working in sitting postures a chair is required to support the seat and back. In this situation



one should alternate active and passive sitting postures. The active posture could be defined as the correct body posture that is maintained by them muscles of the back, the back being leaned forward. This posture cannot be maintained for a very long time. The passive posture is (he one in which the back is sustained by the dentists' back of the chair.

Parameters of the correct working postures'

1. The sitting posture is upright and symmetrical.

2. The shoulders hanging down relaxed with the upper arms beside the upper body.

3. The forearms have been lightly elevated.

4. The angle between lower and upper legs is approx. 105-110.

5. The legs are slightly apart, making an angle of between 30-45°.

6. The patient's head is appropriately rotated in 3 directions.

7. The light beam of the dental operating light is as parallel as possible to the viewing.

8. The sitting location, between 09.00-12.00 o'clock, for left-handed people 03.00- 12.00.

9. The soles should he on the floor.

10. The patient's head is rotated and the sitting location adjusted.

11. Instruments held in 3 supporting points.

12. The upper part of the body should be perpendicular on the chair forward movements should be made without curving the spine.

13. The head could bend 20°-25°.

14. The arms should be close to the body.

MSD PREVENTION STRATEGIES

Selection of Instruments: Tool instrument design should be such that it reduces forceful exertion and maintains hand wrist in neutral posture.

While using hand instruments look for:

1. Hollow or resin handles.

2. Round, Knurled or compressible handles.

3. Carbon steel construction (for instruments with sharp edges).

While using automated instruments look for:

1. Light weight, balanced models

(cordless preferred).

2. Sufficient power.

3. Built in light sources.

4. Angled vs. straight shank.

5. Pliable, light weight hoses.

6. Easy activation.

7. Swivel mechanisms.

MSD Prevention Methods10"

I. Adopting a correct working posture.

2. Use of adequate light.

3. Good planning of dental care sessions.

4. Alternative planning of long and short sessions.

5. Alternating the body postures sitting and upright.

6. Having short breaks after each care session and long coffee or lunch breaks, the sink should be installed at distance.

7. The working day should not be longer than 7 hours.

8. Every 6 weeks a journey should be planned,

9. Sports activities should be practiced for about 45 minutes three times a week.

Goals of ergonomics in any work place should include"

1. Reducing the risk of CTD.

2. Increasing productivity.

3. Increasing safety.

4. Improving the quality of work.

5. Decreasing fatigue and errors.

CONCLUSION:

Ergonomics have come into the profession in a big way. Further development of dental ergonomics must take place on the basis of a coherent vision of the future: Because the work related problem is multifactorial, any possible solution should he multifactorial as well. Available research supports the idea that this problem can be managed or alleviated effectively using a multifaceted approach that includes preventive education, postural and positioning strategies, proper selection and use of ergonomic equipment and frequent breaks with stretching arid postural strengthening techniques. This represents a paradigm shift for daily dental practice. It is important that dentistry incorporate these strategies into practice to facilitate balanced musculoskeletal health that will enable longer, healthier careers; increase productivity; provide safer workplaces and prevent MSD. Right Ergonomics along with regular exercises, relaxation techniques (meditation, biofeedback & yoga), proper nutrition helps us combat stress, thus conserving the productive energy, thereby increasing comfort, improving the quality of life, ultimately leading to extended careers..

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Laser assisted new attachment procedure/ lanap : A review

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N.Raseena Beevi[3]
Presanthila Janam[4]

ABSTRACT

LANAP is a surgical therapy designed for the treatment of periodontitis through regeneration rather than resection. In LANAP surgery, a soft tissue laser is used to treat the periodontal pocket. The laser energy selectively removes diseased or infected pocket epithelium from the underlying connective tissue. The necrotic epithelium is stripped from the connective tissue at the histologic level of the rete ridges. The laser energy is quite selective for diseased tissue, permitting healing and regeneration rather than formation of a pocket seal by long junctional epithelium. LANAP can be associated with cementum mediated new attachment and periodontal regeneration on diseased root surface in humans. This review discusses the need to develop an evidence-based approach to the use of lasers for the treatment of chronic periodontitis.

KEY WORDS : New attachment, regeneration, periodontal pocket, LANAP, photothermolysis

INTRODUCTION

New attachment with periodontal regeneration is the ideal outcome of periodontal therapy because it results in obliteration of the periodontal pocket and reconstruction of the periodontium. New attachment is the embedding of new periodontal ligament fibres into new cementum & attachment of gingival epithelium to a tooth surface previously denuded by disease. Periodontal regeneration can be defined as the restoration of lost periodontium or supporting tissues and includes formation of new alveolar bone, new cementum, and new periodontal ligament 1.

Conventional periodontal therapies including scaling, root planning and periodontal surgery can arrest the disease process, however healing occurs by a long junctional epithelium forming an attachment to root surface i.e. periodontal repair occurs. Repair means the restoration of tissue continuity without its original architecture or function. Long junctional epithelium is less desirable because it eventually may lead to epithelial splitting and formation of a deep crevice (Ishikawa et al 2009). Also the conventional treatment modalities are associated with undesired treatment sequelae, like "long teeth", interproximal spacing and marked changes in phonetics and esthetics.

Over the past three decades periodontal surgery has shifted from a philosophy based on resection (subtractive) to one of regeneration of lost tissues (additive). Conventional resective surgical techniques do not adequately address esthetic concerns of the patient, whereas surgical techniques, which are directed toward regeneration, have as their ideal outcome the preservation and/or restoration of lost periodontal tissues[2]. Also there is a desire among patients & clinicians to treat periodontal disease effectively with minimally invasive therapies and hence the concept of Laser assisted new attachment procedure/LANAP was born back in 1989.

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Lasers have been used by the dentists for a variety of applications for more than a generation. Dr.Robert Gregg and Dr.Mc Carthy[3,4] published research on the use of a specific free-running pulsed neodymium-doped: yttrium-aluminium-garnet (Nd:YAG) laser for the treatment of periodontal disease. They developed a specific protocol, laser assisted new attachment procedure (LANAP) which received United States FDA clearance in 20045. An Nd:YAG laser that operates at a wavelength of 1,064 nm is used in LANAP.

LANAP

LANAP is defined as "cementum-mediated new attachment to the root surface in the absence of a long junctional epithelium[5]. It is a minimally invasive, well-defined procedure, that involves surgical removal of the sulcular epithelium, modification & osteoplasty of bone and perforation of the PDL using piezoelectric bone cutting tips, and wound closure via a thermogenic stable fibrin gel clot, without scalpel or suture[6]. LANAP permits healing & regeneration, rather than forming long junctional epithelium. Pocket reduction, new tissue attachment and lack of tissue recession are achieved with LANAP.

The LANAP protocol 2,7-10:

Step 1

Appropriate laser safety precautions are used. Local anaesthesia is administered. This is followed by bone sounding around each tooth to determine areas of osseous defects that cannot be seen radiographically.

Step 2

This step involves use of laser. A thin 0.3 to 0.4 laser fibre permits easy access deep into periodontal pocket and hence, no need to surgically elevate a flap. The thin optic fibre is placed parallel to the root surface. The first pass with the laser, called laser troughing, is accomplished with the short duration pulse.

This results in removal of diseased epithelium, selectively affect bacteria associated with periodontal disease, affect the calculus present and affect thermolabile toxins. Selective photothermolysis removes diseased, infected and inflamed pocket epithelium while preserving healthy adjacent connective tissue, literally separating the tissue layers at the level of the rete ridges. The bacteria that are associated with periodontal diseases are pigmented and are found in the sulcus, within the root surface and the epithelial cells. Laser at wavelength of 1,064 nm is attracted to pigmented tissues and coloured bacteria causing destruction of periodontal pathogens. The shorter 1,064 nm wavelength is selected for its affinity for melanin or dark pigmentation, unlike the longer wavelengths that are highly absorbed in water and would have a shallow depth of penetration.

Step 3

Piezo-scalers are used to remove the calculus present on the root surfaces. The interaction of laser energy with the calculus makes removal of calculus easier. The initial formation of a mini-flap by laser also assists in the removal of calculus due to increased visibility and access to the calculus.

Step 4

This step also utilizes laser. The parameters are varied to enhance the ability to form a fibrin clot to close the mini-flap and to disinfect the site. The fibrin clot is stable for approximately 14 days. The fibrin clot keeps the sulcus sealed against bacterial infiltration and prevent the growth of epithelium down into the sulcus. Therefore, closure is achieved without sutures or surgical glue. Other laser wavelengths not only lack the ability to form this stable fibrin clot, but also require repeated treatments to prevent epithelium growth down into the sulcus. Through the use of specific fiber sizes, energy, repetition rates, pulse durations and standardization of the energy at the fiber tip, this protocol can be followed in a predictable and reproducible manner.

Step 5

Fibrin clot is compressed to enhance the healing process. Healing of laser wounds occur by secondary intention. Closer approximation accelerates the healing.

Step 6

Refining the occlusion is the last step of LANAP protocol. Occlusion has been considered a greater cofactor in the progression of periodontal disease than smoking. In order to minimize this role, extensive adjustments are made to the dentition.

The patients are then followed for nine to twelve months with routine supra-gingival cleanings and occlusal refinements. No sub-gingival restorative or periodontal probing is done during this time. Only during the final post-operative visit is a periodontal probing done.

BENEFITS OF LANAP 2,6,10,11

- Less invasive
- Less traumatic
- Closure is achieved without sutures
- Minimal postoperative discomfort like pain, bleeding, swelling
- Since LANAP treatment is not a cut-and-sew procedure, no native tissues are injured; the recession associated with traditional surgery is not present. Consequently, the patients do not have root sensitivity or teeth that appear longer.
- Faster healing
- Equally successful results treating dental implants and natural teeth
- Since the laser energy is quite selective for diseased tissue, the underlying connective tissue is spared, thereby permitting healing and regeneration rather than formation of a pocket seal by long junctional epithelium.
- LANAP results in sealing of the pocket orifice with a thermal fibrin clot which acts as a physical barrier preventing the downgrowth of epithelium and promote healing from bottom up rather than the top down by stimulating the release of pluripotential cells from the PDL and alveolar bone.

CONTROVERSY

The pros and cons of this technique is still on debate. The American Academy of Periodontology in 1999 stated regarding this technique , "The Academy is not aware of any randomized blinded controlled longitudinal clinical trials, cohort or longitudinal studies, or case-controlled studies indicating that 'laser excisional new attachment procedure (or Laser ENAP)' or 'laser curettage' offers any advantageous clinical result not achieved by traditional periodontal therapy. Moreover, published studies suggest that use of lasers for ENAP procedures and/or gingival curettage could render root surfaces and adjacent alveolar bone incompatible with normal cell attachment and healing." There is some evidence that the use of lasers in periodontal pockets may damage root surface,[12,13] adversely affect adjacent alveolar bone[14] or cause undesirable pulpal changes[15].

But, human histology studies by Yukna et al[7] in 2007 proved incontrovertibly the positive results of LANAP therapy when compared to conventional periodontal treatment. In this study, 100% of teeth treated with LANAP formed new attachment as opposed to 0% of the control teeth. Nevins et al[8] in 2012 reported another human block study demonstrating highly successful outcomes of patients treated with LANAP in cases of extreme periodontitis.

CONCLUSION

The evidence supporting laser-mediated periodontal treatment over traditional therapy is minimal at best 16. There is a great need to develop an evidence-based approach to the use of lasers for the treatment of chronic periodontitis and this require more number of randomized, blinded, controlled, longitudinal, clinical trials. Lasers in periodontics are an important adjunct & could become an integral part of periodontal therapy; but at present, further research & valid evidence are required before adopting lasers for routine use.

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Inflammatory cytokines in periodontal disease: A review

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ABSTRACT

Periodontitis is a multifactorial disease , where the microbial infection is accompanied by the inflammatory response of the host. This inflammatory response is often sustained leading to progressive destruction of the periodontium. Cytokines are one of the key mediators of inflammatory response. Pro inflammatory cytokines thus needs to be regulated to restore the homeostasis of the tissues. This articles deals with the inflammatory cytokines and the potential therapeutic modes to regulate these cytokines.

Keywords: Inflammatory cytokines, Host modulation, Periodontitis, Anticytokine therapy

INTRODUCTION

Periodontitis is a common, complex multifactorial disease characterized by destruction of periodontal tissues and loss of connective tissue attachment. Presence of bacteria is essential for periodontitis to develop, but they alone are insufficient to cause the disease . Many individuals harbor putative pathogens, but they do not develop the disease. Hence periodontal disease does not appear to be a classical infection, but more as an opportunistic infection. It has been recognized that although bacterial pathogens initiate the periodontal inflammation, host response to these pathogens are equally important. Host response which is intiated to combat bacterial infection, if expressed inappropriately can prove to be the major factor in disease progression. With this shift in paradigm, focus has shifted to host response.[1]

Host modulation therapy has been proposed with a purpose to restore the balance of Pro- inflammatory / destructive mediators and anti inflammatory / protective mediators. Various host modulation agents include those which prevent destruction of extra cellular matrix (MMP inhibitors), prevent destruction of bone (NSAIDS, Bisphosphonates,Vitamin D), prevent destruction of both extracellular matrix and bone (anticytokine therapy, periodontal vaccine, antagonists to cell adhesion molecules) .

This review focuses on inflammatory cytokines and the potential of anticytokine therapy to modulate host response.

CYTOKINES

Cytokines are regulatory proteins controlling survival, growth , differentiation and function of cells. These small soluble proteins are involved in tissue homeostasis.[2] There is abundant evidence that cytokines are secreted by fibroblasts (Moscateli et al 1986), endothelial cells and epithelial cells. However in the diseased state cytokines may be secreted, not only by resident cells, but also by locally infiltrated immunocompetent cells.

FUNCTIONAL CATEGORIZATION OF CYTOKINES[3-7]

FAMILY	MEMBERS
Chemotactic	IL-8, MIP-1, MCP-1, RANTES
Pro-inflammatory	IL-1α, IL-1ß, TNF-α, IL-6
Anti-inflammatory	IL-1Ra, IL-4, IL-10
Growth factor	PDGF, EGF, FGF, IGF, VEGF
immunoregulatory	IFN-γ, IL-2, 4, 5, 7

(MIP - macrophage inflammatory protein, MCP - monocyte chemotactic protein, RANTES - regulated upon activation, normal T cell expressed and secreted, IL-1Ra - interleukin 1 receptor antagonist, PDGF - platelet derived growth factor, EGF - epidermal growth factor, FGF - fibroblast growth factor, IGF - insulin-like growth factor, VEGF - vascular endothelial growth factor, IFN - interferon)

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Thus the cytokines though are involved in various physiological processes have the potential to induce pathology when expressed inappropriately.[8] Anti cytokine therapy for periodontal disease mainly targets TNF-α, IL-1β and IL-6 because they are essential for the initiation of inflammatory reactions and are produced for prolonged periods in inflammatory disease. A knowledge of the role of inflammatory cytokines and their receptors are imperative to better comprehend the anti cytokine therapy.

ROLE OF INFLAMMATORY CYTOKINES IN PERIODONTAL DISEASE

The pro-inflammatory cytokines are:

IL-1 &TNF α-

Induce upregulation of adhesion molecules on leucocytes and endothelial cells, induce expression of other mediators that amplify /sustain inflammatory response, production of lytic enzymes[8]. Synergistic in their capacity to enhance bone resorption,[9] limit repair by inducing apoptosis of matrix producing cells.[10,11]

IL-6 – B cell activation , resulting in non specific antibody production and IL-1 production, enhancement of bone resorption.

RECEPTORS OF CYTOKINE[7]

CYTOKINES	MEMBRANE- BOUND RECEPTORS
IL-1ß	IL-1 RI
	IL-1RII
	(IL-1RAcP)
TNF-á	TNF-RI
	TNF-RII
IL-6	IL-6R (gp130)

ANTI-CYTOKINE THERAPY.

Rheumatoid arthritis is one of the best disease models suitable for anti-cytokine therapy. There are three basic therapeutic strategies including neutralization of cytokines, blockage of cytokine receptors and activation of anti – inflammatory pathways.

Anti-cytokine agents have shown to significantly reduce loss of clinical attachment, loss of alveolar bone & slowing down the progression of experimental periodontal disease in animal studies .12,13 The mechanisms by which the inflammatory cytokines are down regulated include:

i) Use of receptor antagonists

Bind to the receptor on target cell and prevent cytokine from binding to the target cell. eg : IL- 1 antagonist- Anakinra (Kineret)

ii) Use of soluble receptors

Soluble receptors are derived from proteolytic cleavage of extracellular domain of cell bound cytokine receptors. These receptors bind to cytokine in solution and prevent signaling or they bind the cytokine and docks on otherwise non responsive cells and activates them.

Cytokines	Soluble receptors
TNF-α	s TNF – R1,s TNF-R II
IL-6	s IL – 6R

iii) Neutralisation of cytokines (anti- cytokine antibodies)

Antagonists in function and lower down the level of cytokines[14]

Cytokine	Antibodies
TNF-α	Anti-TNF Ab
IL-6	Anti – IL-6 Ab

Cytokine antagonists such as recombinant IL-1 antagonists, soluble TNF receptors, and anti TNF specific antibodies are currently being considered.

Various anticytokine drugs in use for rheumatoid arthritis with potential for use in periodontal conditions include

1)ANAKINRA[15]

IL-1 Receptor antagonist

It competitively inhibits binding of IL-1 to the interleukin -1 type receptor.

2) INFLIXIMAB[16], ADALIMUMAB

Monoclonal antibodies to TNF-α

3)ETANERCEPT[17]

Soluble form of TNF-α receptor.

4) MRA[18]

It is anti-human IL-6 receptor antibody. MRA inhibits IL-6 function by blocking interleukin-6 binding to the IL-6 receptor. Treatment of patients with rheumatoid arthritis shows positive results.

5)RECOMBINANT IL -11

Anti inflammatory cytokine, inhibits TNF-á & other pro-inflammatory cytokines, minimizes tissue injury through stimulation TIMP-1.6 Martuscelli et al 2000-subcutaneous injection of rhIL-11in experimental periodontitis in dogs showed significant reduction in the rate of clinical attachment and radiographic bone loss after an 8-week period.[19]

DRAWBACKS OF ANTICYTOKINE THERAPY

Periodontitis is a microbial infection, hence suppressing cytokines which also a have a protective role leads to suppression of the host immunity . This makes the host vulnerable to microbial infections. To overcome this short coming the use of antimicrobial therapy such as chlorhexidinegluconate in addition to the mechanical control is advised. Host derived anti microbial agents would provide a better treatment option eg: defensins. However care should be taken to rule out any inapparent infections without inflammatory reactions, when antimicrobials are administered along with anti-cytokine therapy.

CONCLUSION

Cytokines are molecules involved in the normal and proper functioning of different physiological processes. However when there is inappropriate balance between the pro inflammatory and anti inflammatory cytokines , there occurs a pathologic condition. There is destructive response of the extracellular matrix and bone leading to progression or worsening of the periodontal status. Hence the various anti cytokine therapy has immense potential in down regulating this altered immune response. Though the various anti cytokine drugs have proved to be of great value in the management of rheumatoid disease, additional clinical trials are warranted to establish their use in the field of periodontics. This vast resource needs to be explored much to further tap the benefits of this knowledge ,we possess, of the cytokines relation with periodontal disease progression.

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Guided pocket recolonization: A review

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ABSTRACT

The development of bacterial resistance to a range of antibiotics by certain pathogens has raised the possibility of return to the pre-antibiotic dark-ages. These developments have encouraged researchers in various fields of healthcare to develop alternative antimicrobial approaches. The application of health-promoting bacteria for therapeutic purposes is one of the strongest emerging fields in this regard. The complexity of the periodontal microbiota resembles that of the gastro-intestinal tract, where infectious diseases are treatable via probiotics; suggesting its use in treatment of periodontitis. This review paper gives a brief insight into the role of beneficial bacteria as a part of treatment regime for periodontitis.

Keywords: Guided pocket recolonization, Probiotics, Beneficial bacteria, Periodontitis

INTRODUCTION

The serendipitous discovery of antibiotics for the treatment of infectious diseases; put a halt to replacement therapy with 'Probiotics' or the so called 'beneficial bacteria'. Antibiotics soon became the accepted, first line drugs in the treatment of infections. But as time passed bacterial species developed resistance to most antibiotics and has become a major issue in present day medical practice. Inappropriate antibiotic treatment and its overuse have been identified as a culprit behind the emergence of resistant bacterial strains. Thus the concept of replacement therapy has now regained momentum to curb the menace of pathogenic microorganisms.

The current concepts regarding the etiopathogenesis of periodontitis involve three factors which determine the risk for a patient to develop periodontitis. These include (i) host susceptibility (ii) presence of periodontopathogens and (iii) the absence of 'beneficial bacteria'[1]. The first factor is the least modifiable as it is difficult to influence host response without the risk of serious side effects. The conventional treatment for periodontitis is aimed at removing the periodontopathogens mainly by mechanical removal of these pathogenic bacteria subgingivally by means of scaling and root planning; which is the the gold standard treatment. This shifts the subgingival ûora to a less pathogenic composition, characterized by high proportions of gram-positive aerobic species[2]. However, recolonization toward pre-treatment levels, primarily by bacteria less strongly implicated as periodontopathogens, occurs within weeks[3], and re-establishment of a more pathogenic microbiota occurs within months.[4] Adjunctive use of local or systemic antibiotics and antiseptics improves the outcome of periodontal therapy only temporarily.[5] Thus the need for a new treatment strategy to prolong or to achieve stable results is warranted.

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DEFINITION

The term 'probiotic' is a relatively new word meaning "for life" and it is currently used when referring to bacteria associated with beneûcial effects on humans and animals[1]. A consensus definition of the term "probiotics" was given by Food and Agricultural Organization of the United Nations and World Health Organization in October 2001 as: "live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host".

HISTORY

Introduction of the concept of probiotics is generally attributed to Nobel Prize recipient Élie Metchnikoff, who in 1907 suggested that "the dependence of the intestinal microbes on the food makes it possible to adopt measures to modify the flora in our bodies and to replace the harmful microbes by useful microbes[6]. Henry Tissier, a French pediatrician, observed that children with diarrhoea had, in their stools, a low number of Biûdobacteria on the contrary, abundant in healthy children.[7] Tissier suggested that these bacteria could be administered to patients with diarrhoea to help restore a healthy gut ûora. The studies and observations made by Metchnikoff, Tissier and others showed the relevance of use of probiotics to ward off infections. Apart from its use as supplementary therapy, the so called bacteriotherapy was largely discontinued with the advent of antibiotics.

CONVENTIONAL USE OF PROBIOTICS

Probiotics have traditionally been used to treat diseases related to the gastrointestinal tract. The most widely used species belong to the genera Lactobacillus and Biûdobacteria[1]. Several gastrointestinal health claims have been made for probiotics, such as the relief of enzymatic maldigestion[8].

ROLE OF BENEFICIAL BACTERIA IN PERIODONTITIS

Studies have shown that where the beneficial bacterial count remains low; it favors growth of certain pathogenic bacteria implicated in periodontal diseases[9,10,11]. However there are studies which show contradictory results also[12]. As such bacteria can affect disease progression in different ways by:

(i) "Passively" occupying a niche which might otherwise be colonized by pathogens,

(ii) Actively limiting a pathogen's ability to adhere to the appropriate tissue surfaces,

(iii) Adversely affecting the vitality or growth of a pathogen,

(iv) Affecting the ability of a pathogen to produce virulence factors, and/ or

(v) Degrading virulence factors produced by the pathogen 13.

Hillman et al (1985) showed that in samples from oral sites where S. sanguinis was detected, Tannerella forsythia was present in 1% of the cases, and in samples were S. sanguinis was not detected; Tannerella forsythia was present in 10% of the oral sites[9]

Stingu et al (2008) showed a possible association of aggressive periodontitis with the loss of colonization with S. sanguinis. Whether or not S. sanguinis offers protection against aggressive periodontitis needs to be determined.[11].

In-vitro studies have shown that S. sanguinis has protective properties by inhibiting and interfering with epithelial cells colonization of A. actinomycetemcomitans[14].

Lactobacillus. paracasei have been shown to produce bacteriocins, which make pores in the cytoplasmic membranes of P. gingivalis, P. intermedia, T. forsythia, S. salivarius and S. sanguinis, inhibiting the growth of those strains[15].

Koll Klais et al showed that a higher prevalence of Lactobacilli(L.gasseri and L.fermentum) in the oral cavity caused a 85% reduction in P.gingivalis and 65% reduction in P. Intermedia growth.[16]

Riccia et al showed that L. brevis incorporated lozenges shows significant improvement not only in the plaque index, gingival index and bleeding on probing, but also a significant reduction in salivary levels of prostaglandin E2 (PGE2) and matrix metalloproteinases (MMPs). [17]

The concept of periodontal replacement therapy, was first proven by Teughels et al, and consisted of

applying beneficial oral bacteria subgingivally to prevent re-colonization of periodontal pockets by pathogens after scaling and root planning. Study was conducted in a beagle dog model. Bacterial mixture used by Tueghels et al was Streptococcus sanguinis (ATCC 49297), Streptococcus salivarius (TOVE) (Tanzer et al., 1985), and Streptococcus mitis (BMS) (Van Hoogmoed et al., 2004). After undergoing root planing, the pure, unsuspended, mixed bacterial pellets were locally applied in the designated periodontal pockets by injection with a blunt needle. Analysis of the data, showed that when beneficial bacteria were applied in periodontal pockets adjunctively after root planing, subgingival recolonization of periodontopathogens was delayed and reduced, as was the degree of inflammation, at a clinically significant level[18].

COMMERCIALLY AVAILABLE PROBIOTICS FOR PERIODONTAL HEALTH

Few products containing probiotics (such as tablets, lozenges, chewing gums or tooth pastes) are currently available:

- Gum PerioBalance (marketed by Sunstar, Etoy, Switzerland) containing patented combination of 2 strains of L. reuteri. Each dose of lozenge contains at least 2 × 108 living cells of L. reuteri Prodentis.
- PeriBiotic (Designs for Health, Inc.,) toothpaste is an all-natural, fluoride-free oral hygiene supplement containing Dental-Lac, a functional Lactobacillus paracasei probiotics not found in any other toothpaste
- Bifidumbacterin, Acilact , Vitanar (marketed by Alfarm Ltd., Moscow, Russia). This probiotics preparation is a complex of five live lyophilized lactic acid bacteria.
- Wakamate D (Wakamoto Pharmaceutical Co., Tokyo, Japan). This probiotic tablet contains 6.5x108 colony forming units (CFU) per tablet of Lactobacillus salivarius WB21 and xylitol (280 mg/ tablet).
- Prodentis (BioGaia, Stockholm, Sweden). This probiotic lozenge is a blend of two Lactobacillus reuteri strains containing a minimum of 1x 108 CFU for each of the strains DSM 17938 and ATCC PTA 5289.[19]

Additional studies are however required to evaluate the long-term effects of using these commercially available products

SIDE EFFECTS

Treatment with probiotic is not risk free. Generally side effects with probiotics is considered mild and unlikely [20]. Increased sensitivity to allergens and acute pancreatitis has been reported in critically ill patients upon prolonged treatment with probiotics. Further studies are required to find association with these findings[21].

CONCLUSION

Application of beneficial bacteria as an adjunct to root planing has been proved to be a convincing treatment approach for treatment of Periodontitis. With the alarming increase in the bacterial resistance to antibiotics and lack of non-antibiotic treatment options, the concept of Guided Pocket Recolonization with probiotics may provide as a supplementary or alternative option for the treatment of Periodontitis. Actions of probiotic microorganisms and their interaction with the host still remains obscure . More studies are required to widen our knowledge on oral beneficial bacteria to explicate their role in improving oral heath. Probiotics presents a promising alternative treatment with fewer side effects in curtailing infections.

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Coverage of Gingival Fenestration Using Coronally Repositioned flap -A Case Report

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Introduction

Gingival fenestration means the exposure of the tooth due to loss of the overlying bone and gingiva.[1] This lesion is seen infrequently, but may be more common than has been reported; lack of symptoms may inhibit patient awareness. The exact etiology is not known, but review of literature suggest that abnormally labioversed root tips, very thin labial plates, occlusal factors, orthodontic tooth movement, and the presence of chronic periapical inflammation may be the probable causes. Several studies have indicated that mucosal fenestration is most commonly seen in anterior teeth region, especially on the labial aspect of tooth angulation, placing root apices in a labial direction. [2]

Though treatment of mucosal fenestration occurring in association with chronic periapical inflammation has been reported previously, the occurrence and treatment of gingival fenestration have not been documented in great detail. Because surgical correction is not usually required, there are very few reports in the literature concerning this lesion.[3] Although they are usually symptom free, they might act as plaque retaining areas resulting in irritation and inflammation of the surrounding tissue. The tooth is rarely spontaneously sensitive and pain might be perceived primarily during masticatory movements or palpation.[4]

The following report has described a unique case of gingival fenestration developed in the upper left central incisor due to chronic periapical inflammation and its surgical treatment with a coronally advanced flap

Case report

A 52 year old female patient reported to the dental office with chief complaint of exposed root surface and pus discharge in relation to right maxillary central incisor. On exploration, she gave the history of trauma in the same tooth around 15 years back for which she underwent root canal treatment. The medical history was non contributory. Clinically discolored, tooth 11 had fenestration of around 5 mm with calculus deposition over denuded root surface. Gingival palpation led to purulent discharge from the fenestrated and inflamed area. Periodontal probing depths were within normal limits on all the surfaces. The IOPAR revealed mild interdental boneloss

Treatment included phase-I therapy (scaling and root planning of the involved teeth), followed by maintenance. Phase-II therapy consisted of coronally repositioned flap. Initially, coronally repositioned partial thickness flap with connective tissue graft was considered, but patient did not agree for second donor site surgery. Therefore, coronally advanced flap was considered.

Baseline data was recorded preoperatively with a gingival fenestration in 11 with visible root surface and a gingival recession with vertical component of 2 mm, probing depth of 2 mm, clinical attachment level of 4 mm.

Clinical procedure

After administration of local anaesthesia, Borders of fenestration were deepithelised .Sulcular incision was given at the coronal margin of the flap to preserve

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Figure 1: Preoperative image showing a gingival fenestration in 11.

Figure 2: deepithelisation around fenestration and crevicular incision

Figure 3: borders of fenestration approximated using 5-0black silk suture

Figure 4: flap coronally advanced and Suture placed

Figure5:14 days post operative

Figure 6: Preoperative image

Figure6:3 month post operative

all existing radicular gingiva. A full thickness flap was raised up to the mucobuccal fold without perforations, which could seriously affect the blood supply. Thorough root planing was done. Borders of fenestration were approximated using 5-0 black silk suture. The flap was positioned coronally in such a manner as to cover as much of the recession defect as possible. Interdental sutures were given using 5-0 black silk suture. Periodontal dressing was applied to the surgical site, and the patient was instructed in normal post-surgical management.

Patient was instructed to avoid any mechanical trauma in the surgical area tooth-brushing. Chlorhexidine rinses (twice daily for 1 minute), antibiotics and anti-inflammatory analgesics were prescribed for five days after surgery. Ten days after surgery, periodontal dressing and the remaining sutures were removed. About 3 weeks after surgery, patient was instructed to continue his mechanical tooth-cleaning with soft toothbrush and toothpaste in the treated area. The patient was recalled at the end of one month, there was a gain in attached gingiva with closure of gingival fenestration in 11

Discussion

A ginival fenestration is a window of bone loss on the facial or lingual aspect of a tooth. It can be distinguished from dehiscence in that the fenestration is bordered by alveolar bone along its coronal aspect.[5] It has also been reported that exposed root tips favor the accumulation of plaque and calculus which prevents the reformation of mucosal covering and may create problems regarding root hypersensitivity, and esthetics.[6]

The first step toward management of mucosal fenestration would be identifying the cause of its occurrence. In the present case chronic periapical infection with overlying buccal bone being very thin or nonexistent could be the cause. Several surgical techniques have been introduced to treat gingival fenestration, including Connective Tissue Grafting

(CTG), various flap designs; orthodontics; and Guided Tissue Regeneration (GTR). However, none of these methods have been proved to be predictable for treating fenestration in human gingival tissues. Among various flap designs, the Coronally Positioned Flap (CPF), solely or combined with other procedures, e.g., subepithelial connective tissue graft (SCTG), has been one of the most widely used procedure.[1] Therefore, in the present case, we selected coronally repositioned flap

The Coronally positioned flap (CPF) is a modality of root coverage surgery that does not involve a palatal donor site and has been demonstrated to be a safe and predictable approach. In patients with high aesthetic expectations, when there is adequate keratinized tissue apical to the root exposure, the coronally advanced flap is the first choice. In this approach, the soft tissue utilized to cover the root exposure is similar in colour, texture and thickness to that originally present at the buccal aspect of the tooth with the recession defect and thus, the aesthetic result is more satisfactory.[7,8]

Conclusion

Mucosal fenestrations and dehiscence are rare entities but whenever present, pose a difficult situation for the clinician. Large fenestration defects pose further challenge resulting in poor prognosis. There have been various non surgical and surgical procedures that have been documented for treatment. The present case report describes a rare situation where a mucosal fenestration developed in the upper right central incisor due to chronic periapical inflammation which was successfully treated by Coronally positioned flap showcasing the procedure as a viable treatment option in such cases.

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Periodontally accelerated osteogenic orthodontics - a case report

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Introduction

Adult patients seeking orthodontic tooth movement have been increasing. They are more concerned related to facial and dental aesthetics, type of orthodontic appliance and also the duration of treatment. There are increased chance for hyalinization during treatment, also cell mobilization and conversion of collagen fibers occur more slowly in adults. Finally, periodontal complications are also more prone to occur in adult patients as teeth move through a non-flexible alveolar bone.[1] The orthodontic movement in these patients can be brought about when well-planned forces are applied to bone which offer less resistance against desired tooth movement, which can result in faster tooth movement. One disadvantage of conventional orthodontic treatment is the time required to complete, which might take even more than a year.[1]

One option for reducing this treatment time is synergestic effect of corticotomy facilitated orthodontic tooth movement along with periodontal tissue engineering and regenerative surgery, which is called Periodontally Accelerated Osteogenic Orthodontics[2]. This treatment can often be completed in one third to one fourth of the traditional orthodontic treatment time.[3] This is also appropriate for both adults and adolescents seeking orthodontic treatment. The alveolar grafting will provide increased alveolar volume and also correct the pre-existing alveolar dehiscences and fenestrations, and any corticotomy-related reduction in bone volume[2].

Periodontally Accelerated Osteogenic Orthodontics has been used to fasten the treatment time. Corticotomy facilitated orthodontics act as an intermediate between orthognathic surgery and conventional orthodontics.[4]

Historical Perspective

Corticotomy facilitated orthodontics has been used in various forms. In 1959 HenrichKole introduced corticotomy facilitated orthodontics for faster tooth movement. He believed that it was the continuity and thickness of the cortical bone that gave more resistance to the tooth movement.[5] He believed that by disrupting this cortical layer, he could decrease the resistance offered by bone and orthodontic treatment can be completed at a much faster time than required with the conventional orthodontic treatment. Kole's procedure involved reflection of full thickness mucoperiosteal flap to expose the buccal and lingual alveolar bone, followed by placement of vertical Interdental cuts penetrating through the cortical bone and barely through the medullary bone (corticotomy style). He then gave subapical horizontal cuts which joined the Interdental cute. This horizontal cuts were of osteotomy style, that is through the full thickness of the alveolar bone. He suggested that the disruption caused the bony segments to move with tooth embedded in this bone. This was termed as the Bony Block Movement[5]. He suggested that bone moved during treatment rather than tooth alone, so the chances of root resorption would not happen and also the retention time would be less. But because of the invasive nature of this procedure, this was not widely accepted.

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Figure.1.Preoperative view

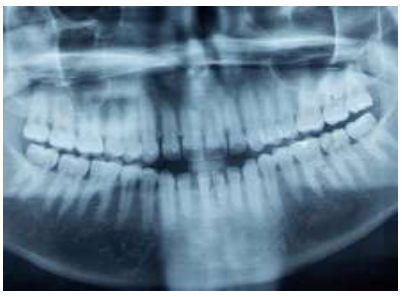
Figure.2. Preoperative radiograph


Figure 3. Internal bevel incision

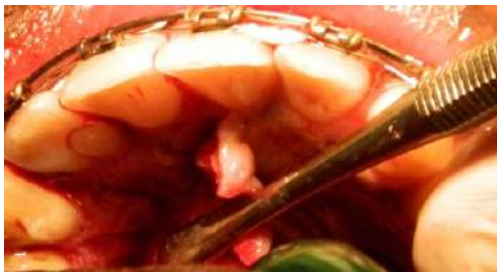
Figure.4.Crevicular incision


Figure 5.Mucoperiosteal flap reflected


Figure.6.Vertical grooves placed


Figure.7.Osseograft placed in I&IVquadrantFigure


8.PRF places in II & III quadrant


Figure 9. Sutures given


Figure. 10.Coe-pak given


Figure 11. Preoperative


Figure 12. Postoperative

Duker used Kole's basic technique on beagle dogs to find out how corticotomy affected the vitality of teeth and marginal periodontium. He found that neither pulp nor periodontium was affected following corticotomy facilitated orthodontic movement and these results substantiated the belief regarding the health of the crestal bone in relation to the corticotomy cuts.[6]

Later Wilcko et al introduced a technique which included the innovative strategy of combining the corticotomy procedure along with alveolar augmentation referred to as Accelerated Osteogenic Orthodontics (AOO), which was later called as Periodontally Accelerated Osteogenic Orthodontics (PAOO)[4,7].

Biology Underlying PAOO

In PAOO, cortical bone is grooved surgically on labial and lingual bone of teeth to be moved and followed by grafting. Orthodontic movement is done after 1 or 2 weeks of healing period. Patient is reviewed for shorter intervals, 2 or 3 weeks for faster rate of activation. Rapid tooth movement by PAOO is based on the Regional Acceleratory Phenomenon (RAP) which is due to a reduced mineralized state (reversible osteopenia)[2].

Herald Frost first described RAP in 1983[8]. He stated that surgical wounding of an osseous tissue can result in striking reorganizing activity and somehow accelerated the regional healing event. He termed this physiologic cascade as Regional Acceleratory Phenomenon. This usually occurs following fracture, osteotomy or bone grafting procedure and involves recruitment and activation of the precursor cells which helps in wound healing following at the site of injury.

A Histologic study showed that selective decortication caused an increase in alveolar spongiosa.[10] This resulted in a temporary osteopenia. This state helps in rapid tooth movement because in this, tooth moves through trabecular bone. As tooth movement occurs, RAP gets prolonged. Once RAP is dissipated, radiographically normal alveolar spongiosa starts reappearing. After completion of orthodontic tooth movement, alveolar remineralization occurs.

The two main features of RAP include decreased regional bone density and accelerated bone turnover following injury which can cause rapid tooth movement[10]. Wilcko et al, showed radiographically an osteoporosis state in the alveolar bone following corticotomy, which is seen in RAP. In Computed Tomography scans they showed that it was not 'Bony Block Movement' that occurred, but a phase of demineralization and remineralization.

Case Report

A 26 year old male patient with chief complaint of forwardly placed front teeth and spacing came to the Department of Orthodontics, SMIDS. The case was diagnosed as Angles Class 1 malocclusion with maxillary and mandibular anterior teeth spacing. Appropriate treatment plan was made through an interdisciplinary approach and PAOO was opted for the correction of proclination and spacing.

Surgical procedure was described to the patient. Other orthodontic treatment options available were also explained to the patient. The patient consented to the PAOO. Prior to the surgical and orthodontic treatment, periodontal health of the patient was restored by scaling and root planing.

Surgical Procedures

All surgical procedures were performed after obtaining the consent of the patient. (Figure 1 and 2) Under Local anesthesia, corticotomy was done in all four quadrants weekly. Internal bevel incisions were given 2-3mm from gingival margin buccally (figure3) and crevicular incisions were given palatally (figure 4). Full thickness mucoperiosteal flaps were reflected beyond the level of the apices of the teeth (figure 5). Vertical buccal and lingual grooves were made in the interdental bone through the cortical layer of the exposed bone with a straight fissure bur mounted on a micromotor hand piece with concomitant saline irrigation, starting 1.5 mm below the interdental crest. (figure 6) These grooves were enlarged using a round bur. Adequate bioabsorbable grafting material [Osseograft in I and IV quadrant (figure 7) and PRF membrane in II and III quadrant (figure 8)] was placed over the decortications site. Osseograft is a de-mineralized bone matrix xenogeneic graft material, which is well known for enhanced bio-activity and proven osteo-inductive capabilities. For the preparation of PRF membrane 10ml of venous blood was collected from the patient. It was then centrifuged at 3000rpm for 10min. Three layers are formed, of which the middle Platelet Rich Fibrin (PRF) clot is separated using a tweezer. It is then compressed between sterile gauze and made into membrane, which is then placed in II and III quadrant.

The mucoperiosteal flaps were replaced and sutured with 4-0 silk suture (figure 9). Coe-pakgiven (figure 10). The patient was given amoxicillin, 500 mg t.i.d. for 5 days and chlorhexidine mouth rinse 0.12% b.i.d. for one week. Over-the-counter diclofenac as needed was prescribed for postoperative discomfort.

The sutures were removed after 1 week and orthodontic retractions were started simultaneously. Patient was recalled every 2 weeks for orthodontic retraction. (Figure 11 and 12)

Discussion

Reduced orthodontic treatment time is an important goal when considering orthodontic treatment for adult patients[7]. Hajji et al, reported an average treatment time of one-third to one-fourth for PAOO procedure compared the conventional treatment time[3]. Wilcko et al, reported an average treatment time of 6.1 months for PAOO procedure[11]. Nowzari et al, reported in his case study that esthetic and functional results as achieved by 8 months (one-third the average treatment time)[12]. In procedure described by Kole et al and Wilcko et al[3,2], corticotomy was performed on both buccal and lingual aspects of maxilla and mandible, while Germec et al and Nowzari et al, reported rapid tooth movement when corticotomy was done on buccal aspects alone on maxilla and mandible[12,13]. This case report is similar to the procedure described by Wilcko et al[4].

From our knowledge this is the first case study where Osseograft (in I and IV quadrant) and PRF membrane (in II and III quadrant) was used simultaneously. We found that healing was similar in both cases.

In PAOO tooth can be moved rapidly, which results in shortened treatment time and is advantageous to the periodontal health of patient, because less time in fixed appliance decreases patient 'burnout' and significantly reduced the time available for the relatively benign commensal bacterial biofilm to assume qualitative changes and convert to a destructive cytotoxic potential often seen when fixed appliance is worn for 2 or 3 years[14].

Case report by Karanth et al, have also reported minimal recession and interdental papilla preservation which insures good post-treatment esthetic results[15].

Conclusion

PAOO is a promising technique which can give several applications in orthodontic treatment. It can result in reduced treatment time, which can benefit patients, especially adult patients. It also reduces root resorption, provides more bone support, due to the addition of bone grafts and enhances post-orthodontic stability. Conversely, the introduction of a surgical phase to this orthodontic treatment may not be convincing for the patient. Only after careful consultation and communication will the patient be able to understand about the benefit of this procedure. PAOO can be very useful treatment option and be a 'win-win' situation for both orthodontist and the patient.

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Laser Assisted New Attachment Procedure in Periodontics

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ABSTRACT

This article presents a general description of the Laser Assisted New Attachment Procedure (LANAP®) Protocol and the benefits of its use to patients. Used by a trained and certified dentist or periodontist, it is a surgical laser procedure designed for the treatment of periodontitis through regeneration rather than resection. The LANAP procedure is a protocol that deals with inflammation, the infectious process, occlusion, tooth mobility, and an osseous component. It is a rather simple, but elegant, protocol that tips the scales in favor of periodontal regeneration.

Keywords: LANAP, New attachment, Nd:YAG lasers, Gingival recession

Introduction

LANAP® laser treatment is in a word – revolutionary. LANAP® laser gum surgery is a minimally invasive therapy for the treatment of periodontal disease, and is a virtually painless alternative to many of the more traditional periodontal procedures.

The objective of LANAP laser therapy is pocket reduction achieved by establishing a new connective tissue attachment to the tooth at a more coronal level. The LANAP procedure provides an environment in which new bone, cementum and periodontal ligament can form on previously diseased root surfaces. LANAP laser therapy allows us to treat periodontal disease with a minimally invasive procedure that eliminates the need, in most cases, for conventional blade surgery (flap and osseous surgery).

History

The concept of the Laser-Assisted New Attachment Procedure (LANAP) was introduced back in 1989 with Drs Robert Gregg II and Del McCarthy.[1,2] As with most general dentists battling with the day-to-day realities of periodontal disease, they were looking for an answer on how to better care for their patients.

The reality at the time was that periodontal disease was difficult to treat and maintain. It was primarily based on older concepts of wound debridement and amputation. Once treated, relapse was common. It is known that periodontal disease is a multifactorial disease process and patient behavioral routines can play a significant role. It is a wonder that the conventional treatments worked as well as they did. Even when they did work, there often were significant secondary repercussions clinically as well as psychologically.

Clinically, many of these traditionally treated cases were difficult to restore whenever dental prosthetic treatment was needed and patients were often left with the compromised aesthetic result of a long tooth appearance. Post-surgically, there was significant root surface exposure and with patient's increased life span and the incidence of dry mouth,

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root caries can become a very difficult entity to control.

More problematic, is that psychologically many of these patients felt that the discomfort from the procedure and/or the residual tooth sensitivity after treatment was so great that they would not complete remaining areas that needed treatment or declined retreatment when they relapsed. Further complicating matters, the patients would recant their experiences to friends and family, making case acceptance for periodontal treatment often a challenge.

During this same time, Drs Gregg and McCarthy were involved in the early use of Nd:YAG lasers in dentistry.[1, 2] Confronted with patients not wishing to lose teeth and declining traditional surgery or extraction, they developed the LANAP protocol, which eventually led to its US FDA clearance in 2004.

In concept, the LANAP protocol is rather simplistic. The ultimate goal is to set up the periodontal environment to promote self-regeneration of the lost attachment and osseous structure that result from periodontal disease. Regeneration is a rather complex event and, as seen with guided tissue regeneration or scaling and root planning alone, can be very unpredictable.

LANAP is predictable. Clinically, those clinicians who have been using the LANAP protocol for some time know this, and its predictability was reinforced when new attachment was found on all the LANAP-treated teeth in the initial histology studies done by Dr Raymond Yukna.[3] LANAP is also a very safe protocol.[4]

The use of the Nd: YAG laser has often been of concern by some owing to possible damage to root surfaces and the tissue attachment but, with a basic understanding of laser physics, laser–tissue interaction parameters were developed that enabled the use of an Nd: YAG in a very safe and effective manner. Because of the simplicity, predictability and standardization of LANAP, it has become a very safe and effective way to treat periodontal disease.

An initial histological report provided evidence of new attachment for LANAP-treated teeth with new cementum and inserting Sharpey fibers.[5] This was confirmed by a recent study documenting human proof of principle for periodontal regeneration with new cementum, periodontal ligament, and alveolar bone adjacent to previously diseased root surfaces.[6]

The LANAP protocol

Step A: Patients undergo a full dental examination and treatment plan as with all dentistry. If they have an appropriate diagnosis periodontal disease, all treatment options are presented to the patient. The initial step of the LANAP protocol, after anaesthesia has been administered, is bone sounding around each tooth. The objective is to determine areas of osseous defects that cannot be seen radiographically.

Step B: This is the first time the laser is used. The objective of this step is to remove only diseased epithelium, to affect selectively bacteria associated with periodontal disease, to affect the calculus present, and to affect thermolabile toxins. The bacteria that are associated with periodontal diseases are pigmented and are found in the sulcus, within the root surface and within the epithelial cells. One of the reasons for the predictability of this step is in the selection of a free-running pulsed Nd:YAG laser with a wavelength of 1,064 nm and pulsed in a range of seven different microseconds. The shorter 1,064 nm wavelength was selected for its affinity for melanin or dark pigmentation, unlike the longer wavelengths that are highly absorbed in water and would have a shallow depth of penetration. This ability to increase the depth of penetration of the laser energy with minimal collateral damage is the reason that the diseased epithelium can be selectively removed without damage to the underlying tissue, leaving intact rete pegs. The diode lasers are also known for this selective absorption in pigmented tissues, but the free-running, pulsed Nd:YAG lasers differ in their ability to operate at very high peak powers in very short time frames, which allows the Nd:YAG to have the greater depth of penetration and the lack of collateral damage (Fig. 1).

Step C: This step in the LANAP protocol is straightforward; it is just a matter of using the piezo-scalers to remove the calculus present on the root surfaces. The removal of calculus is believed to be easier after the interaction of the laser energy with the calculus. The first interaction of the laser results in the initial formation of a mini-flap, thereby further assisting in the removal of calculus because of increased visibility and access to the calculus.

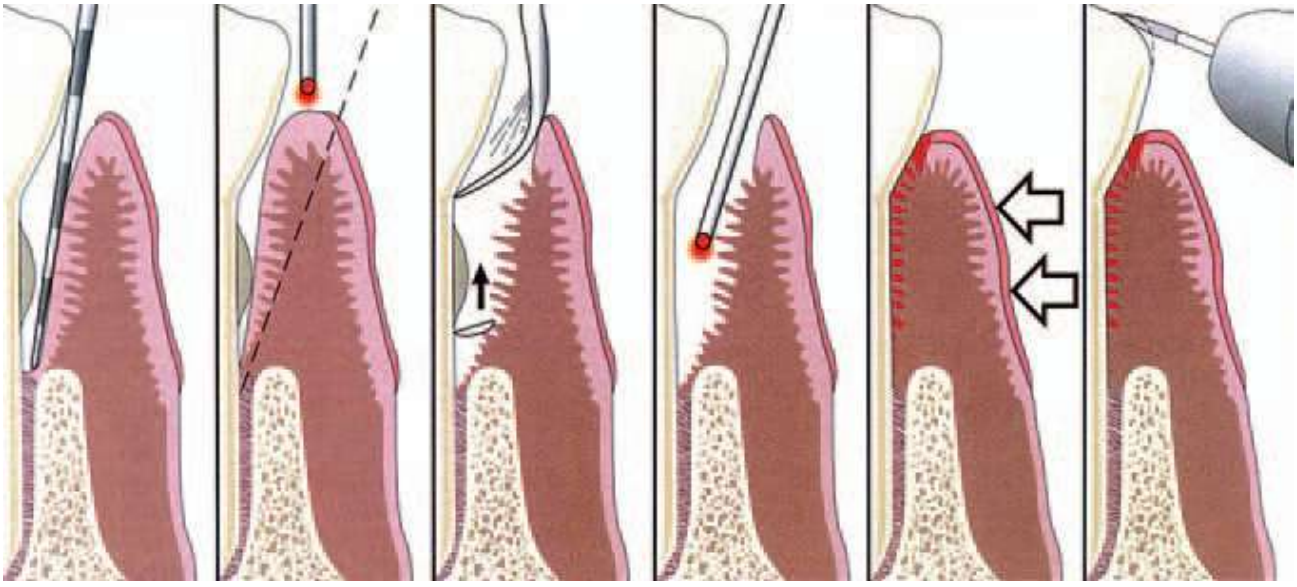

Fig. 1. The clinical steps of LANAP, beginning with charting probe depths (**A**). The primaryendpoint of LANAP is debridement of inflamed and infected connective tissue within theperiodontal sulcus (**B**) and removal of calcified plaque and calculus adherent to the rootsurface (**C**). In addition, the bactericidal effects of the pulsed Nd:YAG laser plus intra-operativeuse of topical antibiotics are designed for the reduction of micro-biotic pathogens(antisepsis) within the periodontal sulcus and surrounding tissues. A second pass with the635 ¼/sec "long pulse" laser finishes debriding the pocket (**D**). Gingival tissue is compressedagainst the root surface to close the pocket and aid with formation and stabilization of a fibrinclot (**E**). The wound is stabilized, the teeth are splinted, and occlusal trauma is minimizedto promote healing (**F**). Oral hygiene is stressed and continued periodontal maintenance isscheduled. No probing is performed for at least six months.

Step D: The next step again utilizes the laser. This time the parameters are varied to enhance the ability to form a fibrin clot to close the mini-flap and to disinfect the site again. The formation of the stable fibrin clot is significant, as it is stable for approximately 14 days. The role of the fibrin clot is to keep the sulcus sealed against bacterial infiltration and to prevent the growth of epithelium down into the sulcus. Other laser wavelengths not only lack the ability to form this stable fibrin clot, but also require repeated treatments to prevent epithelium growth down into the sulcus. Through the use of specific fiber sizes, energy, repetition rates, pulse durations and standardization of the energy at the fiber tip, this protocol can be followed in a predictable and reproducible manner. The high standard of training that each LANAP doctor receives also contributes to the predictability of this protocol and to its safety. Patients often present with different tissue types along with different degrees of disease.

Step E: The fifth step in LANAP is the compression of the fibrin clot to enhance the healing process. Because laser wounds heal by secondary intention, closer approximation enhances the healing time.

Step F: Following the compression and stabilization of the clot, the last step of LANAP is refining the occlusion. Occlusion has been considered a greater cofactor in the progression of periodontal disease than smoking. In order to minimize this role, extensive adjustments are made to the dentition. The patients are then followed for nine to 12 months with routine supra-gingival cleanings and occlusal refinements. No sub-gingival restorative or periodontal probing is done during this time. Only during the final post-operative visit is a periodontal probing done. The hallmark of LANAP is pocket reduction, new tissue attachment and a lack of tissue recession.

Laser Surgery versus Scalpel Surgery

Thorough root surface debridement is critical to successful treatment of periodontal disease. It is difficult to remove subgingival plaque and calculus in pockets that are 5.0 mm or deeper.

A primary objective for surgical intervention is to provide access and visualization for scaling and root planing of these deep pockets.[7] Traditional incisional surgery (such as a flap with osseous resection) results in reduced pocket depth due to apical repositioning of the gingival margin exposing the root surface to the oral cavity.

Scalpel surgery could result in possible attachment loss, gingival cratering. and gingival recession.[8,10,11,21] The pain and discomfort associated with periodontal surgery is well-known.[12] By comparison; laser periodontal surgery eliminates pockets with minimal recession or repositioning of the gingival margin.

Laser troughing makes it possible to visualize and access the root surface by removing necrotic debris, releasing tissue tension, and controlling bleeding. It also defines tissue margins prior to ultrasonic and mechanical instrumentation, preserves the integrity of the mucosa, and aids in maintaining the free gingival crest.[9] This technique allows for selective removal of sulcular or pocket epithelium while preserving connective fibrous tissues.[9]

The hemostatic capability of intraoral laser surgery has been known and utilized for decades; to this end, the 1,064 nm wavelength and 635 μ/sec "long pulse" used in LANAP are designed specifically to maximize intra-operative hemostasis and aid in therapeutic fibrin clot formation as the last step of the procedure[13-20]. Dentists who practice laser sulcular debridement have reported high patient comfort and acceptance.[9]

Advantages of LANAP

- LANAP targets bacteria and diseased tissue only, so the surgical wound is limited to a smaller treatment area.
- No healthy tissue is removed, and there is less recession following LANAP.
- Lastly, the laser uses the body's own biology to seal the surgical sites with a clot. When maintained appropriately, this clot leads to the healing of the hard and soft tissues, thus controlling periodontal disease.
- There is no cutting or suturing as with traditional methods of treating periodontal disease. This provides a fast, virtually pain free procedure with that effectively treats periodontal disease.

Safety Issues

Although Lasers are good therapeutic tools, they are not without risk. Lasers differ from the conventional mechanical tools as they exert their effect both in contact and non contact mode. The dentists must be aware of the risks and must take appropriate precautions to minimize these effects. Special care has to be taken to prevent accidental irradiation of eyes, therefore protective goggles should be worn.

Thermogenesis during tissue interaction must be considered and controlled. During irradiation of periodontal pockets, there is increased risk of excessive tissue destruction by direct ablation and of thermal side effects on periodontal tissue[22]. Improper laser application may cause further destruction of intact periodontium in addition to excessive ablation of root surface and gingival walls.[22]

The oral cavity is a very complex anatomical area and the irradiation target is usually minute and surrounded by important structures, as a result understanding laser irradiation technique and output settings is vitally important for successful treatment.

Conclusion

There is a great need to develop an evidence-based approach to the use of lasers for the treatment of chronic periodontitis. Simply put, there is insufficient evidence to suggest that any specific wavelength of laser is superior to the traditional modalities of therapy. Current evidence does suggest that use of the Nd:YAG or Er:YAG wavelengths for treatment of chronic periodontitis may be equivalent to scaling and root planing (SRP) with respect to reduction in probing depth and sub-gingival bacterial populations.

However, if gain in clinical attachment level is considered the gold standard for non-surgical periodontal therapy, then the evidence supporting laser-mediated periodontal treatment over traditional therapy is minimal at best. Lastly, there is limited evidence suggesting that lasers used in an adjunctive capacity to SRP may provide some additional benefit.

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JSPIK

Recent advances in calculus detection and removal –a review

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ABSTRACT

Periodontal disease is one of the most prevalent disease which is caused mostly by dental plaque or biofilm which later calcified to form dental calculus. Early detection of calculus and its removal thus plays a pivotal role in preventing the progression of periodontal disease. There are currently a plethora of novel modalities in the detection as well as removal of dental calculus. This paper will give an overview of these umpteen modalities and its applications in the field of periodontics.

KEY WORDS: Calculus, spectro-optical, autoflourescence, ultrasonics, laser

Introduction

Periodontal disease and dental caries are the two most prevalent dental infections affecting the mankind[1] Dental plaque or biofilm is the most common aetiologic factor for these diseases which is a defined as "matrix enclosed bacterial population adherent to each other and/or to surfaces or interfaces".[2] Dental plaque undergoes mineralisation which leads to calculus formation. A continuous exchange of ions is always happening on the tooth surface with a constant exchange of calcium and phosphate ions. This leads to formation of calculus which in turn can aggravate the disease process.[3,4,5]

Calculus has been considered as a major aetiological factor for periodontal disease since Sumerian period. Hippocrates, the father of medicine, formally announced the deleterious effects of "pituita" (calculus) present under the root surfaces. Later Abulcasis as well as Paracelsus emphasized on the removal of calculus to halt the disease process. Numerous treatment modalities have been offered for removal of calculus. Currently employed treatment strategies include; hand and ultrasonic instruments, rotary instruments and lasers. Thorough scaling and root planing which involves the removal of deep seated subgingival calculus is a key step in halting the disease process. Detection and subsequent removal of this deep seated calculus is hampered by the location, vicinity and inflamed gingival conditions. Calculus can be defined as a hard concretion that forms on teeth or dental prostheses through calcification of bacterial plaque.[7] Depending upon its location calculus can be classified as either subgingival or supragingival. Various studies carried out to reveal the presence of calculus have shown that calculus is present in 70-100% cases. These studies do not discriminate between supra and subgingival calculus but they indicate high prevalence of calculus in all studied populations.[8] Calculus is primarily composed of calcium phosphate salts covered by an unmineralized bacterial layer. Inorganic content of calculus matches that of bone, dentine and cementum. It mainly consists of dicalcium phosphate dehydrate, octacalcium phosphate, substituted hydroxyapatite and magnesium substituted Tricalcium phosphate (whitlockite). Structure of calculus largely resembles that of dentine, which is porous in nature. Hence it can provide a niche for bacterial growth.[8,9]

MECHANICAL DEBRIDEMENT (Hand and Ultrasonic Instruments)

Non-surgical periodontal therapy is still considered cornerstone of periodontal treatment. Effectiveness of this therapy lies in reducing the bacterial load from periodontal pocket and removal of hard deposits like calculus that cause aggravation of the infection. Studies done to assess effectiveness

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of different treatment modalities in calculus removal concluded that complete removal of calculus from root surfaces is impossible.

HAND INSTRUMENTS

Numerous hand instruments are used for non-surgical periodontal therapy. Scalers and curettes are the most commonly used. Area specific curettes provide maximum access to subgingival calculus. Different aspects of hand instrumentation have been compared with ultrasonic instrumentation. One study has shown that ultrasonic inserts consumed less time to remove calculus when compared to Gracey curettes. In a different study no microscopic difference was found between Cavitron™ ultrasonic scaler and Graceycurettes.[11,15,29]

ULTRASONIC INSTRUMENTS

Ultrasonic instruments have greatly taken over as the unique treatment modality for removing plaque and calculus. Ultrasonic instruments are power driven instruments which oscillate at very high speeds causing micro vibrations which aid in removal of calculus and subgingival plaque. Recent studies have shown that both modalities oscillate in a similar pattern producing similar defects on the root surface. Magnetostrictive and piezoelectric instruments as well as ultrasonic and hand instruments have been compared with each other. One such study has shown that piezoelectric system is more efficient in removal of calculus compared to other two but they left tooth surface more rougher.[11] Certain other studies have produced conflicting results. Hence it is not exactly clear which treatment modality is better and more efficient in removal of plaque and calculus from root surface.

VECTOR™ SYSTEM*

Vector™ system is specially devised to reduce the amount of tooth surface loss and treat the periodontal tissues less aggressively. Uniqueness of this system lies in the oscillations produced by the ultrasonic tip. Ultrasonic tip of this system vibrates parallel to the tooth surface, which leads to less removal of the tooth structure.[16]

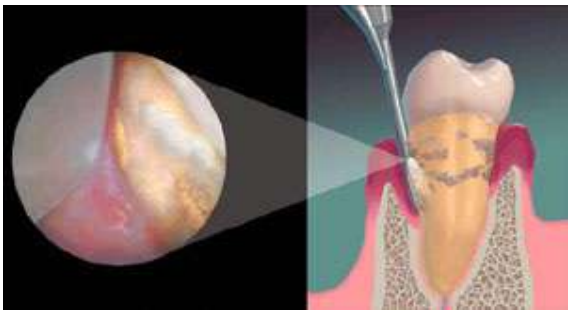
Vector™ system is recommended for use in conjunction with irrigation fluids containing hydroxyl-apatite or silicon carbide. Studies have shown that this system removes calculus efficiently. However, efficiency of the removal is dependent on the abrasive fluid used.[17] One more advantage of this system lies in the reduction in pain perception of the patient. This may be attributed to vertical vibrations of the ultrasonic tip. Studies have shown that abrasive fluid forms a smear layer on scaled tooth surfaces. This smear layer is responsible for reduction in postoperative hypersensitivity.[18] Vector™ system is least efficient when polishing fluid is used with straight metal tip. Use of the abrasive fluid has shown to cause tooth substance loss comparable to hand instruments. Hence, Vector™ system can be an efficient adjunct for scaling and root planing. It can also decrease the pain sensations during treatment owing to type of oscillations of the tip. But further studies are warranted to assess the efficacy of this system for in vivo use.

LASERS

LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Maiman first introduced laser device in 1960. The advantage of lasers lies in the fact that lasers can concentrate the light energy at a single point and target the tissues accordingly. Kinersly et al (1965) first used ruby lasers for removal of calculus from tooth surfaces.[19] Various types of lasers are used in the field of dentistry. Depending on the frequency lasers can cut hard tissues or soft tissues. Nd: YAG laser has been approved by FDA in 1990 primarily for soft tissue surgeries and in 1999 for use on hard tissues. This laser can also be used for removal of calculus. Various studies have shown Nd: YAG laser demonstrates partial removal of calculus from root surface. Extensive studies have been carried out on Er: YAG laser since its introduction by Zharikov in 1974.[20] Er: YAG laser is primarily absorbed in water making it an ideal for hard tissue ablation. Absorption in water causes less damage to hard tissues owing to less amount of heat production. Studies done to assess the efficacy of lasers in calculus removal have shown comparable results with hand and ultrasonic instruments. Er: YAG lasers cause comparable loss of root substance to hand instruments.[21] It has been reported that lasers cause approximately 40-136μm deep ablation of cementum.[22] Lasers when compared to ultrasonic instruments for their efficacy in calculus removal lasers have shown inferior results to ultrasonic instruments.[23]

DETECTION OF CALCULUS

Current treatment strategies for removal of biofilm are based on non-specific plaque hypothesis which considers biofilm as a whole for initiation of


disease. Hence non-surgical periodontal therapy comprises of thorough removal of plaque and calculus from root surfaces. Most important aspect of these modalities is detection of calculus using tactile sense of the operator. Visibility is a major factor that limits detection of sub-gingival calculus. Hence operator has to rely on either periodontal probe or explorer or curette to detect the presence of subgingival calculus. Smooth and clean root surface is often considered as the endpoint of scaling and root planing. Clinicians tend to remove excess amount of root structure due to hampered visibility to achieve a smooth root surface. To counteract the above stated problem many systems have been developed to aid the clinician for detection of calculus. These systems are broadly classified as calculus detection systems and systems with combination of detection and removal[23,24,25]

DIAGNODENT™

Calculus and tooth structure differ in composition. This structural difference gives a typical fluorescence to both these structures. Calculus contains various non-metal as well as metal porphyrins and chromatophores which make it able to emit fluorescent light when irradiated with a light of certain wavelength. Diagnodent™ makes use of this property of calculus to detect its presence. Calculus and teeth fluoresce at different wavelength region of 628-685nm & 477-497nm respectively. Diagnodent™ involves use of an indium gallium arsenide phosphate (InGaAsP) based red laser diode which emits a wavelength of 655nm through an optical fibre causing fluorescence of tooth surface and calculus. As per some studies ,calculus detection using autoflourescence resulted in a significantly smaller total area covered with residual calculus than if diagnostics was based on a conventional explorer.

DetecTar™ ‡

DetecTar™ uses a Spectro-optical approach in order to detect subgingival calculus by utilizing a light emitting diode and fiberoptic technology. This involves an optical fibre which recognizes the characteristic spectral signature of calculus caused by absorption, reflection and diffraction of red light. The signal is sensed by the optical fibre which is converted into an electrical signal which is analysed by a computer processed algorithm. The DetecTar device comes as a portable cordless handpiece with a curved periodontal probe that has millimetre markings to measure pocket depths. Without any tactile pressure the subgingival root surface can be scanned by the instrument. As soon as calculus is detected ,the operator receives the information on calculus localization by audible and luminous signals.[11,29]

PERIOSCOPY™ †

Perioscopy involves a modified medical endoscope exclusively for periodontal purpose. This was developed in year 2000. It consists of a fiberoptic bundle surrounded by multiple illumination fibres, a light source and irrigation system. Its miniature nature causes minimal tissue trauma. Fiberoptic system permits visualization of the subgingival root surface, tooth structure and calculus in real time on a display monitor.[11]

PERIOSCAN™

Perioscan™ can differentiate between calculus and healthy root surfaces. It also has a treatment option that can be used to remove these calculus deposits immediately. This combination of detection and removal mechanism is advantageous since calculus can be removed just by switching the mode from detection to removal. The advantage lies in the fact that relocating the previously located calculus is not necessary.[11]

Perioscan™ is an ultrasonic device that works on acoustic principles It is similar to tapping on a glass surface with a hard substance and analysing the sound produced to find out the cracks that are present on

glass. Tip of the ultrasonic insert is oscillating continuously. Different voltages are produced due to changes in oscillations depending on the hardness of the surface. Hardness of the calculus differs from the hardness of the tooth surface. This difference in hardness can be used to generate the information of the surface that is being touched by the device.[26] This instrument is used in two different modes. Whenever ultrasonic tip touches the tooth surface a light signal is displayed on hand-piece and actual unit. Light signal is also accompanied by an acoustic signal. During calculus detection mode, the instrument shows a blue light when calculus is present. Once a healthy root surface is attained, green light is displayed when the ultrasonic tip touches healthy cementum. Different power settings aid the clinician in removing tenacious calculus. The only clinical study available for this device has stated a sensitivity of 91% and specificity of 82%

Merits

1. Handpiece contains fiberoptic system to enhance the visibility of the operator.
2. Less incidence of overzealous instrumentation
3. Acoustic system can help the colour blind operator in better assessment of the calculus.
4. Less amount of healthy tooth substance removal.
5. No additional equipment is necessary due to provision for scaling is embedded in the device.
6. Easy detection of subgingival calculus with different colours denoting presence or absence of calculus

Demerits

1. Low specificity
2. Root surface irregularities can be mistaken for calculus.

KEYLASER3™

Keylaser3™ combines a 655nm InGaAsP diode for detection of calculus and a 2940nm Er: YAG laser for treatment. Previous versions of this system (Keylaser 1 and 2) can be used for removal of calculus only. A scale of 0-99 is used for detection of calculus. Values exceeding 40 indicate definite presence of mineralized deposits. Er: YAG laser is activated as a certain threshold is reached. As soon as the value fall below threshold level Er: YAG laser is switched off. Studies done to assess the efficacy of this device have shown that it produces tooth surface comparable to hand and ultrasonic instruments. Cost factor can be a limiting aspect for using lasers for detection and treatment[11,29]

KEYSTONE HYPOTHESIS –THE RECENT THEORY BY GEORGE HAJISHENGALLIS

Recent studies have highlighted the importance of the human microbiome in health and disease. However, for the most part the mechanisms by which the microbiome mediates disease, or protection from it, remain poorly understood. The keystone-pathogen hypothesis holds that certain low-abundance microbial pathogens can orchestrate inflammatory disease by remodelling a normally benign microbiota into a dysbiotic one.[30]

CONCLUSION

There are a umpteen number of studies have been performed to assess the efficacy of hand and ultrasonic instruments in removal of calculus. Most studies indicate that some amount of calculus is always left behind irrespective of the methodology used for its removal. Percentage of residual calculus on tooth surfaces varies between 3-80%.[27,28,29] With the emerging concepts of Ecological and specific plaque hypothesis, and the recent keystone hypothesis, smoothening of root surfaces is not deemed necessary for achieving periodontal regeneration, however no periodontist will like to leave out a rough, unclean surface behind at the end of the treatment. To achieve a clean, smooth root surface, clinicians inclined towards overzealous instrumentation. Postoperative sensitivity and pulpitis is a major problem associated with such instrumentation. Studies have shown that approximately 20 strokes of hand instrument were sufficient to remove complete layer of cementum from the root surface. Recent studies have also shown that endotoxins released by bacteria are not firmly adherent to root surfaces and can be removed by systematic instrumentation. Hence current treatment strategies rely on tactile sense to detect calculus so as to achieve proper root debridement. Deep pockets, furcal openings as well as variations in tooth anatomy complicate the issue further by making them inaccessible to non-surgical periodontal therapy.. Perioscan™ equipped with inserts can prove handy in such situations. With the knowledge that remnant calculus can lead to periodontal abscesses it becomes so important to completely remove the calculus without causing excess root surface removal.

Treatment strategies enumerated above are completely based on non-specific plaque hypothesis which targets biofilm as a whole instead of targeting specific bacteria as researchers are yet to come up with a solid tool to detect and eradicate the specific micro-organisms which are responsible for the disease in a clinical setup.[29] A plethora of techniques have been used to identify calculus deposits present on the root surface.. An instrument that can integrate calculus detection and removal is highly desirable as it can decrease chair-side time, lead to efficient scaling and avoid overzealous instrumentation. Such an instrument can prove to be an excellent tool in the hands of an experienced and skilled practitioner. It can also increase the patient compliance towards further dental treatment and aid in education and motivation of the patient. Perioscan™ which detects and removes the calculus simultaneously may be a useful tool in the hands of a general dentist with a regular clinical setup and can turn out to be a valuable adjunct in the clinician's armamentarium for efficient scaling along with minimal removal of healthy tooth substance. In comparison to other instruments used for calculus detection and removal .There are lots of studies currently going on pertaining to this and the proper implementation of such novel technologies with the involvement of Government so that it should be made available at tertiary healthcare systems so that the majority the common men who are always being downtrodden may get benefitted. There should be cost effective measures which helps in the detection of calculus at early stage so that the progression can be halted and more preventive strategies can be undertaken.

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