Editorial

Going green" means to pursue knowledge and practices that can lead to more environmentally friendly and ecologically responsible decisions and lifestyles, which can help to protect the environment and sustain its natural resources for current and future generations.

Regardless of wherever you go, people across the globe are now focusing on going green since it positively impacts the planet. From plastic bag recycling to the treatment of chemical products, people are trying to come up with new and useful ways that are sustainable and useful in helping the world go green. Going green is a personal choice that is embraced by individuals to contribute towards the betterment of this planet and make the world a better place to live for the generations to come. You can decrease the number of pollutants that are emitted into the air by choosing eco-friendly means. This makes both the indoors and outdoors have cleaner air for you and others to breathe.

We in our institution have started several initiations for keeping our campus green. Paper less communications, planting saplings in & around our college, parking vehicles away from college premises, avoiding plastics within campus, methods of recycling etc. helps to start a small step towards go green.

Your contribution, no matter how small the involvement may be, will give us all a sense of pride knowing that we are all having an input in to a better, safer and cleaner environment and help to reduce waste and CO2 emissions. By getting actively involved and positively contributing to the environment through your ideas, skills and passion, we can all agree protecting our future through Real Life Options is certainly worthy.

“Living in a more green way and reducing our carbon foot prints today will create a better path for tomorrow”

Dr Manoj Kumar KP
Editor

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Literature Review

3D PRINTING AND ITS FABRICATION TECHNIQUES: A REVOLUTION IN PROSTHETIC DENTISTRY

*Dr. Ranjith M, **Dr. Pranav AG, ***Dr. Sheejith M,**** Dr.Nivea Francis

Abstract

The evolution of 3D Printing in the beginning of 1980s to construct models from a computed file brought in a proportional change in biomedical disciplines The advancements have developed into an essential tool which is incorporated in surgical planning, treatment, and fabrication of dental prosthesis. The technology aids in the construction of three-dimensional (3D) structures with complex geometries with ease that can be difficult to fabricate by other various methods. The purpose of this paper is to review the different techniques of 3D printing used in contemporary prosthetic rehabilitation as this technology has become widely spread in the field of medicine and dentistry. It is a sort of additive manufacturing technology where a three-dimensional object is made by laying down successive layers.

Key Words: 3D-printing, rapid prototyping, additive manufacturing of prosthetic construction

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Introduction

The concept of computer-aided design/computer-aided manufacturing (CAD/CAM) of objects was invented long time ago in the 1970s and has already been applied in the field of dentistry for decades in fabrication of dental restorations in Prosthodontics. In 1984, Chuck Hull developed 1st working 3D printer.[1] Today, 3D printing techniques is experiencing rapid development due to the expiration of many patents and 3D printing described as the key technology of the next industrial revolution. 3D printing is the process in which multiple layers of materials are added layer by layer under computer aided design software or Artificial intelligence assistance to create 3-dimensional prosthesis. The process is more correctly described as additive manufacturing and it is also known as rapid prototyping. It is the perfect solution to get customized prosthesis in the field of dentistry. Typically, prosthesis or implants have to match with the patient's morphology and aesthetic view. And it is also true because everybody has their own aesthetic view, all patients esthetical approach is unique and different. Now it is possible to get an accurate 3D prosthesis that will lead to dental and prosthetic rehabilitation, with solutions totally adaptable and acceptable to patients' requirements. The transition of 3D printing to its clinical application in prosthetic dentistry is highly dependent on the available materials, which must not only provide the required accuracy but also the necessary biological and physical properties.[2] 3D printing is the key to modern Prosthetic dentistry, as it is really helpful for dental labs and Clinician because it is time-saving method. It can revolutionize prosthetic dentistry. Unfortunately, due to high cost of device, materials, maintenance and repair, difficulty faced in post processing and sometimes onerous health and safety concerns.[2] In this review various 3D printing techniques and their use in the field of dentistry has been discussed.

3D printing techniques

3D printing techniques have widely improved and improvised drastically in the 21st century, allowing their integration into the digital workflow for prosthetic applications.[3] A wide range of materials has been applied such as wax, resin, metals and recently zirconia.[3] Additive manufacturing technologies are the CAM technologies that include the fabrication of a prosthesis in a layer-by-layer building-up process. Many different and unique printing technologies exist,3D printing is being expanded to various areas with in dentistry other than prosthetic fabrication.

1. Stereolithography

Stereo lithography (SLA) is the first additive technology in the field of 3D printing, was created by Chuck Hull in 1980.[1] Stereolithography (SLA) is the oldest and most commonly used method of 3D printing in dentistry.[3]

This technique can be subdivided according to the build platform motion and laser movement. This method was used for manufacturing of prototypes, models and casting patterns. The indications for the use of SLA introduced the term "rapid prototyping''.[3]

In SLA, the building platform base is immersed in a liquid resin and it is polymerized by the aid of ultra violet laser. Laser targets and draws a cross section of the object to form each layer.[4] The laser is focused with the help of multiple lenses and then reflected towards the two motorized scanning mirrors (galvanometer).[4] The depth of cure determines the z-axis resolution, and is controlled by the photo initiator and irradiated exposure conditions as well as other dyes, pigments, or other added UV absorbers.[4] In addition to the activation of the monomer by the aid of scanning laser in the SLA process, a projection-based SLA technique named digital light processing (DLP) is the second technique that is commonly used.[4]

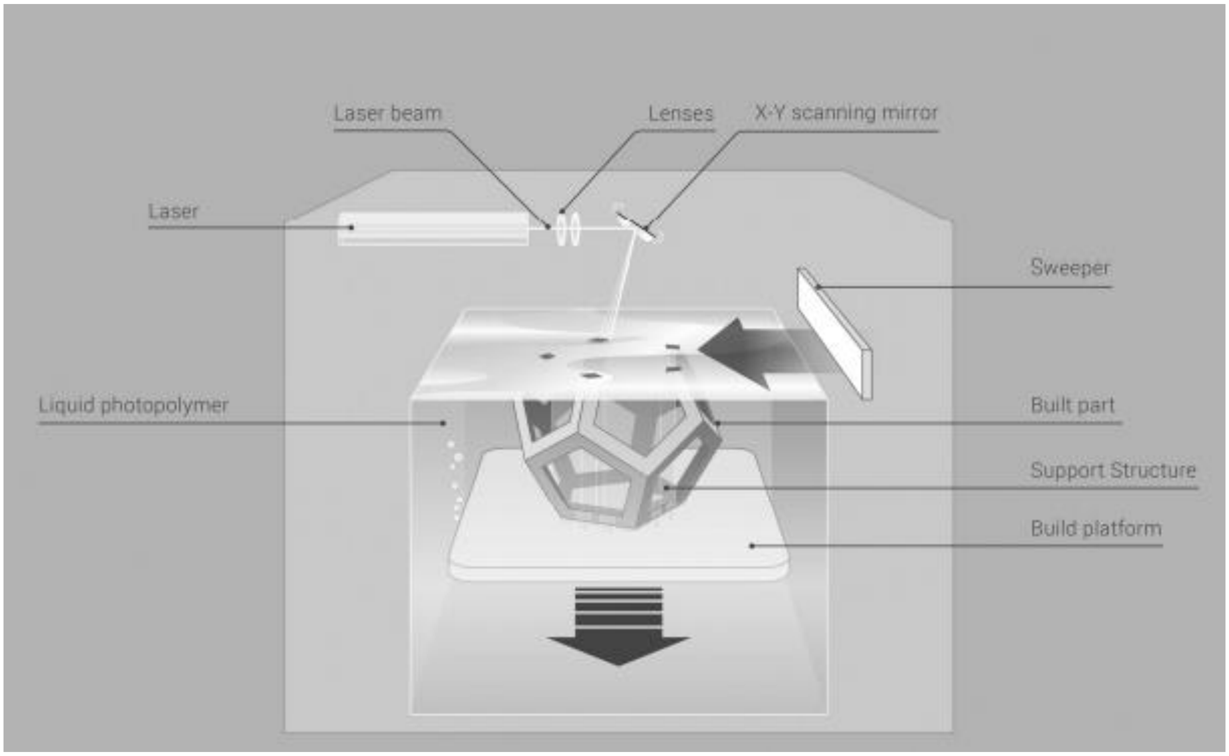

Figure 1: Stereolithography

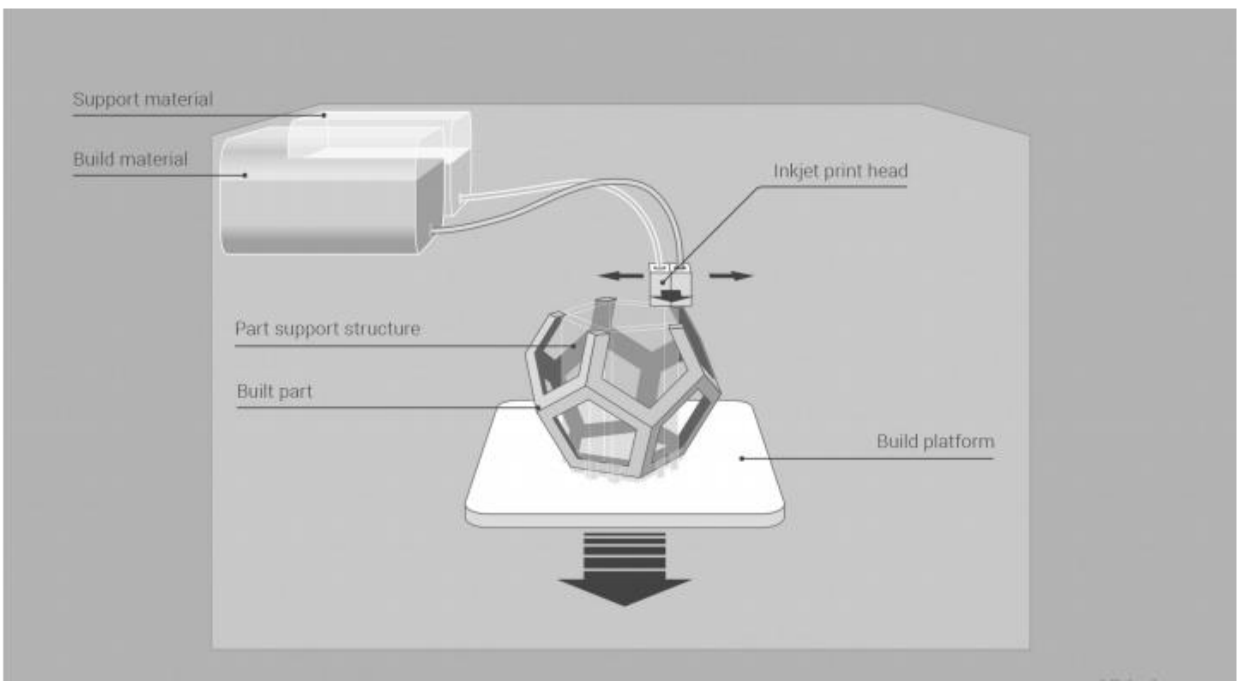

Figure 2: Material jetting

Table 1: Comparison between Stereolithography and Digital light processing

Photo polymerization	SLA	DLP
Additive manufacturing process	Photo polymerisation	Photo polymerisation
Advantages	• High accuracy • Smooth surface finish • Possible transparent objects • Good mechanical strength • Fine build details • low tolerance	• Fast • Smooth surface finish • Possible transparent object • Fine build details
Disadvantages	• Expensive • High material cost • Only photo materialized materials • Post curing required	• Only photo polymerized resin • Post curing required • Single material vat
Applications	• Model • Surgical guide • Splint • Tray • Temporary restoration, • Gingiva mask • Denture[4]	• Surgical guides • Resin pattern • Temporary restoration • Dental models • Cast coping • Wax pattern

2. Digital Light Processing

The main difference between SLA and DLP is the light source, where the image is produced by an arc lamp or by microscopically small mirrors laid out in a matrix on a semiconductor chip, referred to as a digital micromirror device (DMD). In this system the physical object is pulled up from the liquid resin, rather than down and further into the liquid photo polymeric system.[5] The radiation passes through a UV transparent window.[5] The process is repeated until the 3D object is built. SLA and DLP technology are still limited in the processing of several materials in one construction process.[5] SLA and DLP is the most advanced 3D printing technology in Prosthetic dentistry. It is costly when used for large objects, but it is popularly used for industrial production of 3D printed implant drill guides.

3. Photo Polymer Jetting(PPJ) and Material Jetting (MJ)

In the photopolymer jetting and material jetting processes, the object is built up in layers by a print head with several linear nozzles.The principle is comparable largely to that of conventional 2D inkjet printer. Instead of ink droplets, a photosensitive material such as liquid photo monomer is used for photopolymer jetting and thermoset photopolymers (acrylics) that are available in liquid form and wax is used for material jetting.[6] In both photo polymer jetting and material jetting, the monomer is cured in layers by the help of UV light or the wax solidifies thermally on the building platform. Material jetting creates parts of high dimensional accuracy with a really smooth surface finish.[6] Multi-material printing and a good range of materials (such as ABS-like, rubber-like and fully transparent materials) are available for Material Jetting. The surface quality of the objects as well as the print resolution is very high in the photopolymer jetting and material jetting process. Similar to SLA and DLP, the photopolymer is vulnerable to sunlight and heat, and the material can creep over time.[7] For printing, photopolymer jetting and material jetting are the most expensive technologies. Prosthetic teeth and implant drilling templates are produced with the aid of jetting process.[8]

4. Binder Jetting

The binder jetting printing process uses two materials; a building material (powder based) and binder (liquid based). Binder jetting a different form of photo polymer jetting process is to apply an adhesive to powdery substrate using pressure nozzles. [9]The binder acts as an adhesive between layers created by powder.[9] A print head moves horizontally along the x and y axis of the machine and deposits alternating layers of the build material and thus the binding material. After each layer, prosthesis being printed is lowered on its build platform. In binder jetting, for fabrication of prosthesis metal and silica powders are being used, then it is subjected to a sintering process where the adhesive is burned out. [10]

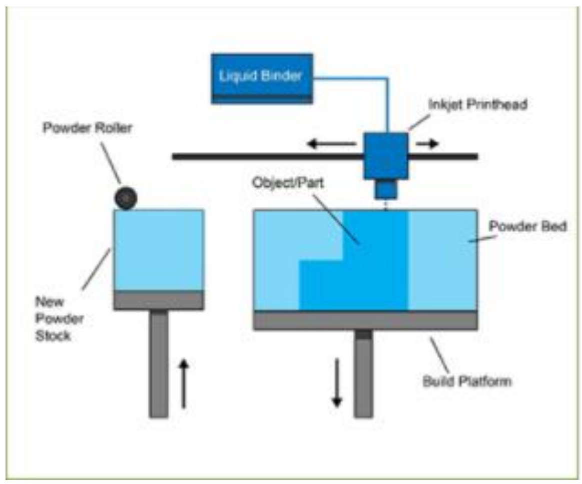

Figure 3: Binder jetting

Due to high amount of adhesive content, which leads to sinter shrinkage and porosity and subsequently infiltrated. With the help of several print heads prosthesis with different colours can be fabricated. Due to complex geometries and different parameters in dentistry, applications of binder jetting are limited. They are mostly used in surgical planning models.

5. Laser sintering

Selective laser sintering (SLS)

SLS technology has been available since 1980. It is associate additive manufacturing (AM) technique that uses an optical laser as the power supply to sinter pulverized material, aiming the optical laser mechanically at points in area outlined by a 3D model, binding along to make a solid structure.[11] Polymers used in this process have high melting points and excellent material properties.

Figure 4: 3D printer SLS

Objects made in this way are used as anatomical study models, cutting and drilling guides, dental models, and for engineering/design prototypes. However, some of the materials are difficult to drill and prepare, and the technology is costly to purchase, maintain, and run. SLS, a new technology primarily, has been used for rapid prototyping and for low-volume production of prosthetic components such as customised dental and zygomatic implants.[12]

Selective Laser Melting (SLM)

Selective laser melting (SLM) also known as laser powder bed fusion (LPBF) or direct metal laser melting (DMLM), is an Additive Manufacturing technique developed to melt and fuse the metallic powders via a high power-density laser. The principle of the SLM process starts with a building platform applied with very thin layers of metallic powders which are completely melted later by the help of thermal energy induced by one or several laser beams.[13] The cross-section area of the designed 3D part is made by selectively melting and re-solidifying metallic powders in each layer. The building platform is then lowered by a little distance and a replacement layer of powders are deposited and levelled by a re-coater. The laser beam(s) are often directed and focused through a computer guided and generated pattern by carefully designed scanner optics. Therefore, the powder particles are often selectively melted within the powder bed and formation of 3D objects consistent with the CAD design.[14]

Direct metal laser sintering (DMLS)

Direct metal laser sintering (DMLS) is a laser-based Additive Manufacturing technique, in which an object is built layer by layer using powdered metals, radiant heaters, and a computer-controlled laser. Basically, the machine produces the object on a moveable platform by applying incremental layers of the pattern material. [15]A high-power laser beam is directed towards powder bed and programmed to fuse metal powders present in its focal zone, according to a computer-assisted-design (CAD) file, thus generating a thin metal layer.

Table 2: Comparison between Photo polymer jetting,Material jetting and Binder jetting

Method	**Photo polymer jetting**	**Material jetting**	**Binder jetting**
Material	Photopolymerized resin	Slurry	Powder
Advantage	• Multicolour materials possible • Fast fabrication • Immediate solidification of each layer due to photopolymerization	• Fast fabrication • Low material cost • Multicolour material is possible • Wide material options	• Fast fabrication • Low material cost • Multicolour material is possible
Disadvantage	• Only photopolymerized material • Post curing required	• Large tolerance • Low mechanical strength • Rough surface finish • Layers may collapse during building process	• Large tolerance • Low mechanical strength • Rough surface finish
Applications	• Resin mocks up • Dental models • Occlusal splints[11]	• Dental models	• Surgical planning models

Table 3: Comparison between Selective laser sinthering,Selective laser melting and Direct metal laser sintering

Laser sintering	**SLS**	**SLM**	**DMLS**
Material	Resin, materials and ceramics[14]	metals	metals
Advantages	Printed objects with 100 % density is possible	Printed objects with 100 % density is possible	Printed objects with 100 % density is possible
Disadvantages	Expensive Thermal distortion	Expensive Thermal distortion	Expensive Thermal distortion
Applications	Metal copings and framework	Metal coping and frame work	Metal coping and frame work

The platform moves down the pre-programmed layer thickness, a fresh film of powder is laid down and the next layer is melted with exposure towards laser source, so that it confirms to the previous layer embedded. This process continues, layer by layer, until the prosthesis is fabricated.

Conclusion

Developments in the field of science and technology may look fictional but it has the potential to disrupt the future, some of the experiments are in naive phase. 3D printing technology has potential in terms of cost, productivity and time in the field of dentistry.[16,17] Mechanical, clinical and evidence-based research has to done further for its efficacy and its further applications in dental industry, they have to innovate, improve and optimise surface quality and reliability.

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Literature Review

HOT TOOTH

* Dr. Nejiya PK, **Dr. M Ramesh Kumar, ***Dr. Elsy P Simon, ***Dr. Ravi S V

Abstract

The successful management of pain has been one of the cornerstones of endodontic practice and dentistry worldwide since time immemorial. Achieving profound pulpal anesthesia not only helps patients overcome their fears and displeasures towards dentistry but also favors the dentists who will be less stressed worrying about the patient's reaction or sudden movement during the treatment procedure. But, achieving adequate anesthesia in patients with a hot tooth, which is a tooth with irreversible pulpitis, can be a challenge. This article describes the hot tooth, reasons for anesthetic failure and some of its management strategies

Key Words: hot tooth, irreversible pulpitis, local anaesthetic, nerve block

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Introduction

As an endodontist majority of us have faced the situation of inability to anesthetize a tooth even after injecting many catridges of local anesthetics. This embarrassing situation is common during the endodontic treatment of mandibular molars. Such a tooth which is reistant to anesthesia is referred to as HOT TOOTH.[1]

The term ''hot'' tooth generally refers to a pulp that has been diagnosed with irreversible pulpitis, with spontaneous, moderate-to-severe pain. A classic example of one type of hot tooth is a patient who is sitting in the waiting room, sipping on a large glass of ice water to help control the pain.[2,3]

Inflammatory changes within the pulp progressively worsen as a carious lesion nears the pulp.[4] Chronic inflammation takes on an acute exacerbation with an influx of neutrophils and the release of inflammatory mediators (such as prostaglandins and interleukins) and proinflammatory neuropeptides (such as substance P, bradykinin, and calcitonin gene-related peptide). These mediators, in turn, sensitize the peripheral nociceptors within the pulp of the affected tooth, which increases pain production and neuronal excitability. All of this leads to the pain that patients report as they sit in the dental chair.[5,6]

Theories of hot tooth

Location –improper site of injection, can lead to partial numbness or an ineffective injection.[7]

Local tissue changes because of inflammation – This theory states that the area of inflammation around the inflammed tooth is causing the anesthetic to be less effective. According to this theory, the lowered pH of inflamed tissue reduces the amount of base form of the anesthetic available to penetrate the nerve membrane. Consequently there is less of the ionized form within the nerve to achieve anesthesia. It can be true only in cases of swelling. This theory does have a limitation, as it does not explain injections that are distant area from the area of inflammation, also, it is unable to explain that why it is difficult to anesthetize a tooth with pulpitis with an inferior alveolar nerve block.[8]

Hyperalgesia – This theory states that the inflammation within the tooth has altered the actual nerve making it more difficult to numb. The nerve arising in an inflamed tissue have altered resting potentials and decreased excitability thresholds. These changes are not restricted to the inflamed pulp itself but affect the entire neuronal membrane extending upto central nervous system. Local anesthetics are not sufficient to prevent impulse transmission, owing to the lowered excitability thresholds.[9,10]

The nervous patient – In some cases being nervous, apprehensive or jumpy has the vicious cycle of lowering the pain threshold. Initial apprehension leads to decreased pain threshold causing anesthesia difficulties, which leads to increased apprehension, which results in loss of control and so on.

Time – In some cases it may just be a time factor, as some patients take more time than others for anesthetic to diffuse and block the sensory nerves.The anesthetic solution may not penetrate to the sensory nerves that innervate the pulp, especially in mandible.[11]

The Central Core theory- It states that nerves on the outside of the nerve bundle supply molar teeth whereas nerves on the inside supply anterior teeth.[7] The anesthetic solution may not diffuse into the nerve trunk to reach all nerves to produce an adequate block, even if deposited at the correct site. This theory may explain the higher experimental failure rates in anterior teeth with the inferior alveolar nerve block.

TTX-resistant channels- Scientists have shown that there is a special class of Sodium channels on C fibers, known as tetrodotoxin-resistant (TTXr). In case of inflammation, neuroinflammatory reactions start and Sodium channel expression on C fibers shifts from TTX sensitive to TTX resistant creating inflammatory hyperalgesia. One of the clinically significant characteristics of these Na+ channels are relatively resistant to lignocaine. Researchers found these channels to be five times more resistant to anesthetic than TTX-sensitive channels. After a nerve block, a patient may describe profound anesthesia of soft tissue where no inflammation is witnessed. However, entering the vital pulp chamber may initiate pain.[12]

Out of the above mentioned theories theory stating about tetrodotoxin-resistant (TTXr) is the latest and most accepted one. But the problem is to manage such a condition.

Management of Hot Tooth

1) Patient's education:

Patient should be groomed and acknowledged about the treatment so that he is mentally aware of procedures and the fear of unknown is eliminated thus reducing anxiety.

2) Management of anxious patient:

a) Give short morning appointments followed by good morning breakfast.

b) Premedication with lorazepam 1 mg (after checking interaction with other drugs) night before sleep followed by 90 minutes prior to procedure.

c) No driving & need to be accompanied with friend/relative/escort.

d) Extremely short or no waiting time in waiting area.

e) Duration ,only as much as patient can tolerate Making sure patient feels he/she is in command.

f) Iatrosedation: Vocal sedation- Use of sentences like "I will be careful", Talk to them as you go through procedure, Avoid use of words like hurt,sharp etc, Music, Aroma, Hypnosis, Acupuncture, Relaxation techniques(deep breathing, guided imagery,progressive relaxation) will be helpful.

3) Role of premedication:

If required anti-inflammatory can be prescribed to be taken as 1 hour before the treatment. Providing enough time between anesthetic delivery and start of procedure.

4) Before starting access preparation a small test cavity can be made to ensure effectiveness of anesthesia.

5) Additional anesthetic or supplemental injections are necessary to achieve profound anesthesia.

Suggested local anesthetic technique sequences for maxillary and mandibular endodontically-involved teeth

Pre-surgical NSAID po 1 h prior to appointment

- Ibuprofen 600 mg

LA of choice for surgery

- Articaine, Lidocaine, Mepivacaine, Prilocaine

Long-acting LA at end of surgery just prior to discharge of patient

• Bupivacaine

NSAID on timed basis (q4,6,8h) for xx days

• Ibuprofen 600 mg qid

Postsurgical telephone call early evening

Maxillary teeth:

1. Infiltration

a. Preferably with buffered lidocaine or articaine

2. Appropriate NB (ASA, PSA, AMSA)

a. Supplement NB with buffered articaine buccal infiltration (1.0 mL)

3. Consider sedation

a. Inhalation sedation with N2O–O2 preferred

If necessary:

4. PDL injection

5. IO (rarely necessary in maxilla)

6. Intrapulpal (rarely necessary in maxilla)

Mandibular teeth:

1. Block technique: IANB, Gow-Gates NB, Akinosi- Vazirani NB

a. Preferably with buffered lidocaine or articaine

2. Supplement NB with buffered articaine infiltration in buccal fold of tooth to be treated (1.0 mL)

3. Consider sedation

a. Inhalation sedation with N2O–O2 preferred

If necessary:

4. PDL injection

5. Intraosseous

6. Intrapulpal

Conclusion

To acquire pulpal anaesthesia in a hot tooth is a real challenge for endodontist. Fortunately, today there are many options for the dentist to choose from. New local anesthetics (e.g., articaine); buffered local anesthetic solutions; newer techniques (e.g., Gow-Gates NB; Vazirani-Akinosi NB); and articaine administered by buccal infiltration in the mandible, all work to increase the likelihood of endodontic treatment being delivered painlessly.[10,11]

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Literature Review

RETRIEVAL METHODS FOR FRACTURED IMPLANT SCREWS

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Abstract

In implant dentistry, dental implant screw loosening and fracture complications can be as high as 45% over a 10-year period. Once a screw has fractured, it can be challenging to remove it from the implant chamber. A variety of techniques are used nowadays to manage these clinical situations. The purpose of this review is to understand about various methods of retrieval of fractured implant parts. A PubMed/MEDLINE search was conducted to gather available reports. A total of 21 articles were included which described about the management of fractured implant parts.

Key Words: Retrieval techniques, fractured implant screws, implant complications

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Introduction

Implantology is the branch of dentistry that deals with the permanent implantation of artificial teeth in the jaw. Implant therapy is one of the most effective and reliable options for replacing missing teeth. But, even with the high success and survival rates of dental implants, clinicians may still have to deal with a variety of complications.[1] Complications may be described as minor, moderate, or severe. Minor complications are those that can be easily resolved with little morbidity or expense. Moderate complications may be resolved without major expense but require more physical intervention to reverse the complication and severe complications are those that require replacement of critical components and result in a level of patient morbidity.[2]

Complications can also be described as mechanical, technical and biological in which mechanical includes screw loosening, screw fracture and cement failure, technical comprises of fracture of veneering porcelain, fracture of the framework in implant supported fixed partial dentures and biologic encompasses adverse soft tissue reactions, sensory disturbances and loss of bone integration.[3]

Several methods are available in literature for retrieval of fractured implant screws. Managing fractures of implant abutment screws is challenging because of the uncertainty associated with the removal of the fractured screw fragments.[4] This review article mainly describes the various methods available for the recovery of fractured implants.

Methodology

A PubMed/MEDLINE search was conducted using the terms “retrieval techniques”, “fractured implant screws”, “implant complications”. 447 Articles dated between 1980-2021 were found in the search, out of which 426 articles were excluded because they didn’t match with the review criteria. 21 articles were found relevant for the study which included various techniques for retrieval of fractured implant screws. Current textbooks were also used.

Many methods were discussed by various authors which has been explained in this literature review. Basic method include the use of various hand instruments like artery forceps, explorers, spoon excavators, which is commonly used in case of fractures occurring in the coronal third of implant chamber.[5] The oscillations from an ultrasonic scaler can gradually reverse out the screw by placing the thin tip of the scaler directly on the top of the screw along with lubricants like eugenol or mineral oil to reduce friction and easy removal.[5] Use of high-speed handpiece equipped with a diamond bur is another retrieval technique which involves the preparation of a 1 mm slot across the most occlusal portion of the broken screw fragment followed by use of a suitable-sized mini flat-end screwdriver to reverse out the screw. A low-speed contra-angle handpiece with a one-quarter round carbide bur running in a reverse mode could also help to rotate out the screw. The small round drill acts as a screwdriver and holds the head of the fragment.[5]

There are many types of screw/implant retrieval kit made by Nobel Biocare, Neobiotech, etc. which is particularly useful when the broken screw is fractured in the apical 50% of the implant chamber. In this technique, an appropriate drill guide is inserted into the implant platform followed by use of a contra-angled handpiece with the pilot drill at 1,000–1,250 RPM in reverse with a pumping motion and copious irrigation to create a 1–2 mm deep dimple into the fractured screwhead. This creates a purchase point for the next drill tap. Proper suction of the metal shavings has to be done with proper irrigation. While still in reverse, use the tap drill at 70–80 rpm, which will reverse out the broken screw from the screw chamber.[5] Agustin-Panadero et al had used a special mechanical kit with a guide cylinder for different implant connections in which they have created a perforation with a drill, designed with a circular groove in its active portion, at 1200 rpm. The fragment was then retrieved with another tapered, reverse threaded drill that turned counterclockwise at 50-80 rpm.[6] Special mechanical kit without a guide cylinder had also been used in which initially a ball bur was applied at a maximum speed of 850rpm to create a perforation in the fragment, followed by use of another pyramidal drill to engage and extract the screw fragment, turning it counterclockwise at 15 rpm.[6] To understand the performance of a repair service set for the retrieval of fractured abutment screws, Igarashi et al had conducted an invitro study in which they had prepared twelve abutment screws for intentional fracture by means of a steel plunge. The participants mounted the drilling guide No.1 of the Straumann® service set into the implant cone and onto the implant shoulder followed by a conventional drill in counterclockwise direction. The bur cut completely through the fractured screw till the drill stop was reached and a drill guide No. 2 was mounted onto the shoulder of the implant to receive the 6 hand tap instruments to remove the remaining fragments inside the implant body.[7]

Chen and Cho had used an ultrasonic instrument and a dental restoration holder in a patient with both the abutment and the abutment screw had fractured. Ultrasonic instrument mobilized the fragment and a sharp dental explorer rotated the fragments in a counterclockwise direction. If the dental explorer fails to rotate the fragment, stiffer instruments such as a hand scaler could be used to engage the fractured surface. Modification of the screw, or even implant, may be necessary if the fragment still fails to rotate. Then they had rotated one-quarter turn clockwise first and then in a counterclockwise direction.[7] .According to a study on retrieving fractured intramobile elements from Osseo integrated implants by McCartney et al, they had used a size 100 endodontic file with a slight bend at the tip which was inserted into the central threaded chamber of the intramobile element fractured segment followed by rotation of the file counterclockwise, applying apically directed pressure.[8]

Maalhagh-Fard and Jacobs had retrieved a stripped abutment screw after creating a trough between the abutment screw head and the internal aspect of the implant by using a high-speed handpiece with a no. 2 round rotary cutting instrument and the head of the abutment screw was then loosened with the use of fine forceps.[9] A noninvasive method described by Gooty et al had used a tissue punch to expose the implant site followed by the use of a ¼ round bur in a high speed hand piece. An ultrasonic scaler with no. 3 tip is placed in a 1mm deep pit at the most occlusal portion of the broken screw fragment, which is prepared by moving in an anticlockwise direction and thus screw is retrieved slowly.[10,11]

Use of a special fork-shaped tip of the long-shank stainless steel instrument (Fragment Fork; Astra Tech) by Iman et al to thread the broken screw fragment deeper into the implant had gained popularity among the retrieval methods. Application of a retaping tool (Zimmer Dental) to retap the damaged threads by gently rotating the tool clockwise by not more than 1800 and then rotating it counterclockwise is done. Then they tried to remove the fractured screw with the forked screw retrieval instrument after retaping the threads above the fragments.[12] Yilmaz and McGlumph described the use of a fragment removal instrument in a slow speed handpiece to retrieve a screw fragment. Exposed surface of the fragment in the screw hole was located and then centered the instrument on the fragment. Tip of the instrument was used to apply force to the exposed surface of the fragment. Once the tip is engaged, application of reverse torque is done followed by little force to retrieve the fragment.[13] Use of a hypodermic needle of 10 to 34 gauge by Yang and Wu is another successful retrieval method. For this the sharp tip of the needle has to be flattened and made round by placing a K file followed by bending the needle to transform into a custom screw-driver which was advanced into the implant until the fractured screw is engaged properly. Application of gentle pressure on the fractured screw by the screw driver followed by rotation in counterclockwise direction is done to loosen and remove the fractured screw.[14]

Assumption of systemic review

Many techniques are available in literature for the retrieval of fractured implant screw. Each method has its own advantages and disadvantages. Based on the type of fracture and the position of fracture, management option varies. Basic management includes the use of explorers, forceps, excavators etc. Or a scaler tip can also be used which helps in easy management. Even though it is considered as an easy treatment option, care must be taken because there is a chance of instrument fracture and damage to the implant. Similarly, while using instruments like endodontic files proper wariness must be there. If these hand instruments cannot figure-out the situation, ultrasonic scalers can be used instead or it can be used in combination with the hand instruments. Screw-retrieval kits are also available which may be helpful when basic techniques become unsuccessful.[15]

If the screw fragments cannot be retrieved with these basic cavitron and instrumentation, it can be rotated using rotary instruments which may unwind the screw fragments. Whichever may be the retrieval technique, care must be taken not to damage the internal threads of implant. Although a fractured screw should be retrieved and replaced by a new one without any damage to the internal threads of the implant, in some cases, it cannot be removed.[16] In situations where screw fragment is irretrievable, either a cast dowel with ball attachment may be a useful compromise option for replacing failed implant abutment screws[17] or the clinician may choose to remove the implant and place a new one.[15]

Conclusion

Abutment screw fracture, although uncommon, occurs during rehabilitation of the dental implant in clinical practice. In most circumstances, the fractured end can be retrieved and replaced by a new abutment screw. However, sometimes the screw cannot be removed conservatively. Various management modalities regarding retrieval of fractured screw have been presented in this review article.

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Literature Review

PULPAL RESPONSE TO BIODENTINE

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Abstract

A new tricalcium silicate-based cement, Biodentine which has dentin-like mechanical properties and can be used as a dentin replacement in the tooth crown and root region. The cement consists mainly of a tri- and dicalciumsilicate powder, which is mixed with an aqueous calcium chloride solution. As regards biocompatibility, long-term impermeability, antibacterial properties, induction of hard tissue regeneration, stability, low solubility, non-absorbability and ease of handling, Biodentine fulfils the requirements found in the literature for a material suitable for dentin replacement. On the basis of the good material properties of Biodentine, this cement is an interesting alternative to the conventional materials which were recommended earlier. Biodentine can therefore confer advantages in day-to-day practice and with correct diagnosis contribute to the long-term maintenance of the vitality of the dental pulp and to the retention of teeth

Key words: pulp response, biodentine,dentin replacement

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Introduction

Clinical dentistry has been facing the challenges of replacing lost dentin for years.[1] Calcium hydroxide (CH) has been intensively used as a liner in the treatment of deep carious lesions with or without pulp exposure, mainly for its antibacterial properties. CH is subject to dissolution over time due to the inward and outward movement of fluid inside the dentinal tubules, and this movement leads to the formation of a dead space. Moreover, CH is unable to adhere on one side to the tooth structure and on the other side to the restoration. These major drawbacks often lead to a loss of seal and to bacterial contamination.[2]

To resolve this major problem in restorative dentistry, various materials such as Tricalcium silicate–based materials like mineral trioxide aggregate (MTA) are commonly used.[1] Advantage of using calcium silicate-based materials as dentin replacement is the leaching of calcium hydroxide from the set material, biocompatibility, bioactivity, ability to set under wet conditions, dimensional stability, and formation of an efficient seal that limits bacterial contamination.[3]

But MTA exhibits many disadvantages such as difficult handling, long setting time, induction of tooth discoloration and incompatibility with other dental materials when layered. In an attempt to overcome the disadvantages presented by MTA, second generation tricalcium silicate–based materials like Biodentine exhibiting improved physical properties were introduced.[4] Biodentine is a water-based cement exhibiting a short and clinically suitable setting time. It is perfectly biocompatible and capable of inducing the apposition of reactionary dentin by stimulating odontoblast activity and formation of reparative dentin, by induction of cell differentiation. It is in effect a dentin substitute that can be used as a coronal restoration material (for indirect pulp capping), but can also be placed in contact with the pulp. Its faster setting time allows either immediate crown restoration, or to make it directly intraorally "functional" without fear of the material deteriorating.

Composition

The liquid contains Calcium Chloride as a setting accelerator and a water reducing agent. The presence of a setting accelerator allows the material setting in 12 min and the presence of a water reducing agent avoids the formation of cracks within the material. Such cracks are usually observed after setting of cements containing high percentage of water. The materials prepared by adding 5 drops of liquid to the powder presenting the capsule.[6]

Setting reaction

The calcium silicate has the ability to interact with water leading to the setting and hardening of the cement. This is a hydration of the tricalcium silicate ($3CaO.SiO_2 = C_3S$) which produces a hydrated calcium silicate gel (CSH gel) and calcium hydroxide ($Ca(OH)_2$).

$$\underset{C_3S}{2(3CaO.SiO_2)} + 6H_2O = \underset{CSH}{3CaO.2SiO_2.3H_2O} + 3Ca(OH)_2$$

This dissolution process occurs at the surface of each grain of calcium silicate. The hydrated calcium silicate gel and the excess of calcium hydroxide tend to precipitate at the surface of the particles and in the pores of the powder, due to saturation of the medium. This precipitation process is reinforced in systems with low water content. The unreacted tricalcium silicate grains are surrounded by layers of calcium silicate hydrated gel, which are relatively impermeable to water, thereby slowing down the effects of further reactions. The C-S-H gel formation is due to the permanent hydration of the tricalcium silicate, which gradually fills in the spaces between the tricalcium silicate grains. The hardening process results from of the formation of crystals that are deposited in a supersaturated solution. The working time of Biodentine is up to 6 minutes with a final set at around 10-12 minutes. Biodentine has a consistency after mixing which enables manipulation with a spatula, with an amalgam carrier or with carriers which are used for endodontic cements in retrograde fillings.[6]

Cellular changes in pulp following biodentine application

Biodentine is bioactive because it increases murine pulp cell proliferation and biomineralization. Furthermore, it induces transforming growth factor b1 release from human pulp cells and early dental pulp mineralization.[7] In contact with animal pulps, Biodentine induced cell proliferation and formation of mineralization foci, which were strongly positive for osteopontin. At longer time points, the formation of a homogeneous dentin bridge at the injury site, secreted by cells displaying an odontoblastic phenotype, was observed.[7] Histologically, the bioactive tricalcium silicate demonstrated the ability to induce odontoblast differentiation from pulp progenitor cells. The resulting mineralized matrix had the molecular characteristics of dentin. Previous studies have also shown that Biodentine stimulates dental pulp stem cell migration, proliferation and differentiation to odontoblast-like cells similar to MTA.8b-catenin expression was observed in the Biodentine treated group, suggesting the involvement of Wnt signalling in Biodentine induced reparative dentine formation.[9]

Comparison of pulpal response of Biodentine with calcium hydroxide and MTA

The quality of a hard tissue bridge at the exposure site has been recognized as an important factor for the clinical success of direct pulp capping. The main objective of an ideal capping material in exposed pulp might be complete reconstitution of the pulp periphery with a dentin-like matrix. Although calcium hydroxide had previously been the gold standard for direct pulp capping, it has several disadvantages that resulted in poorer clinical outcomes compared with other materials. An important disadvantage of calcium hydroxide treatment is the tunnel defects present in the newly formed dentine bridge allow access for bacteria to penetrate into the pulp (Janebodin et al. 2010, Shayegan et al. 2012, Tran et al. 2012). The calcium silicate-based materials, MTA and Biodentine produced a higher quality of reparative dentine compared with calcium hydroxide. Nowicka A et al reported that the light microscopic analysis has confirmed complete dentinal bridge formation directly underneath both Biodentine and ProRoot MTA. Groups with Biodentine and MTA showed layers of well-arranged odontoblasts and odontoblast-like cells, as well as no evidence of inflammatory pulp response below the dentinal bridge.[10]

An alkaline environment is optimum for inhibiting bacterial growth and promoting odontoblast differentiation and hard tissue formation (Janebodin et al. 2010, Song et al. 2017). Calcium hydroxide paste, or Dycal (Dentsply, New York, USA), dissolves and releases hydroxyl ions (OH) after contacting tissue fluid, increasing its pH to 12–13 (Song et al. 2017). This harsh alkaline condition may cause irritation and damage to the odontoblasts, causing local tissue necrosis where the calcium hydroxide and pulp tissue contact. In contrast, calcium silicate-based materials with a pH of 8–9 (Rajasekharan et al. 2014) caused less pulp tissue inflammation according to histological data.10 Other studies also revealed that calcium hydroxide was cytotoxic to dental pulp cells (Camargo et al. 2009).[11] Furthermore, the irritation that occurred after calcium hydroxide treatment tended to last longer than with calcium silicate-based materials due to the variation in dissolvability of the materials.[12]

In a study by Xuan Vinh, showed that the direct pulp capping using Biodentine™ or MTA, the histological results confirmed the formation of a regularly dense mineralized tissue well-localized at the injured site.[13] This study suggest that the calcium-silicate-based cements used as pulp capping materials provide an optimal environment for pulp healing, resulting in a reparative dentin resembling on certain points primary dentin.[14] Some authors reported that MTA-based cement induces pulp tissue recovery as well as reparative dentin formation superior to calcium hydroxide-based cement in the dog, monkey, and rat models. In another study, carried out with miniature pigs, the mineralized tissue formation in a dentin bridge shape was observed similarly with WhiteProRoot® MTA and Biodentine™.

Other authors conclude that mineralized tissue formation with Biodentine™ therapy translates into thicker and more morphologically organized dentin bridges than those using MTA-based cements. In other studies, reparative dentin formation has demonstrated in wells restored with Biodentine™ in miniature pigs, with a significant deposition increase when compared with calcium hydroxide-based cement.[15] This study reported that the treatment based on mineral trioxide aggregate (WhiteProRoot® MTA) and tricalcium silicate (Biodentine™) present slight and reversible inflammatory signs in the pulp tissue, with the formation of mineralized tissue.[15]

K. Yaemkleebbua reported in a study that Biodentine treated group had a significantly better quality of reparative dentine formation compared with the control group (no treatment group). There were no significant differences in the reparative dentine formation scores for the Ca(OH)2 and MTA groups compared with the control group.[9] SEM findings confirmed a protective dentin bridge at the site of pulp exposure. With Biodentine, At higher magnification, dentinal tubules were seen in the newly formed mineralized tissue, evoking a tissue resembling tubular dentin. Electron probe microanalysis results revealed that the mineralization level of this new reparative tissue was similar to the level of primary dentin.[9]

Although MTA and Biodentine are both calcium silicate-based capping materials, these materials generated different results. Interestingly, Biodentine treatment resulted in superior outcomes compared with MTA. The results were similar to those of Nowicka et al. (2013) who also found no clinical or radiographic failure after pulp capping with Biodentine. Their histological analysis revealed complete dentine bridge formation after direct pulp capping with Biodentine compared with MTA; however, inflammation did not occur in the Biodentine-treated group.[9]

Although both are composed of synthetic tricalcium silicate, Biodentine TM is in the triclinic form with a finer particle size, while MTA is in the monoclinic form. The handling of the materials might also affect their mechanical properties. Biodentine comes in a premixed capsule that is mixed using an amalgamator; however, the MTA powder and liquid are measured and mixed by hand. After setting, Biodentine has a denser microstructure and less porosity compared with MTA (Camilleri et al. 2013). More calcium ions were released from Biodentine compared with MTA, and consequently, more hard tissue formation occurred (Rajasekharan et al. 2014). Therefore, Biodentine has been used in many clinical situations for vital pulp therapy of both primary teeth and immature permanent teeth (Bogen & Chandler 2010, Jung-Wei & Monserrat 2010).[9]

A long setting time may be inconvenient to both dentist and patient, because it requires direct pulp-capping with MTA in two visits: application of MTA in the first visit and seating of the permanent restoration over the sufficiently hardened MTA in the second visit. Moreover, it may increase the risk of bacterial contamination. Short setting times will make it possible for treatment to be performed in one visit. Biodentine was reported to have efficacy similar to that of MTA in direct capping over mechanically exposed molar pulps. Complete dentinal bridge formation, an absence of inflammatory pulp response and layers of well-arranged odontoblasts and odontoblast-like cells were observed after 6 weeks.[16-18]

Conclusion

Development of minimally invasive biologically based therapies aimed at preservation of the pulp vitality remains the key theme within contemporary clinical endodontics. The present findings confirm that both MTA and Biodentine are reliable materials in the matter of inducing dentin bridge formation while keeping a vital pulp in both direct and indirect pulp capping procedures. This review also reports Biodentine's superiority in relatively easier manipulation, lower cost and faster setting when compared to MTA with comparable or even outstanding clinical outcomes. High biocompatibility and excellent bioactivity further go in favor of this dental replacement material, although more long-term clinical studies are needed for a definitive evaluation of Biodentine as a pulp capping agent.

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Literature Review

METHODS FOR STRENGTHENING OF DENTAL CERAMICS

* Dr. Vidya V, **Dr. M Ramesh Kumar, ***Dr. Elsy P Simon, ***Dr. Ravi S V

Abstract

As a restorative material, dental ceramics posses a major drawback of being brittle which is due to its low tensile strength and low fracture toughness. Methods to strengthen ceramics majorly fall into two categories including methods of strengthening the brittle materials and methods of designing components to minimize stress concentration and tensile stress.

Key Words: dental ceramics, transformation, stress

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Introduction

The demand for tooth-colored restorations has grown considerably during the past decade. In addition, ecological considerations and patient's concern regarding amalgam fillings are increasing day by day. Since their introduction into clinical routine, the ceramic restorations have proven to provide a satisfactory long-term esthetic results superior to other restorative materials as long as they are properly planned and fabricated.

Ceramics are widely used in dentistry due to their ability to mimic the optical characteristics of enamel and dentin as well as for their biocompatibility, long term color stability, wear resistance and their ability to be formed into precise shapes.

One of the major disadvantages of ceramics is its poor tensile strength making the material brittle. Various approaches have been developed through these years to strengthen the material there by improving their clinical performance. Methods of strengthening ceramics are as follows:

- Development of residual compressive stress within the surface of the material:
  - Ion exchange
  - Thermal tempering
  - Thermal compatability
- Interruption of crack propogation through the material
  - Dispersion strengthening
  - Transformation Toughening
- Minimizing the number of firing cycles
- Optimum restoration design
- Shot peening

Ion exchange (chemical tempering)

If sodium containing glass article is placed in a bath of molten potassium nitrate, potassium ions which are 35 percent larger than sodium exchange places with some of the sodium ions in the surface of the glass article and remain in place after cooling. This surface compression gives an increase in strength on the surface of porcelain. But the depth of compression zone is less than 100 micrometers and hence the strengthening effect will be lost on long term exposure to inorganic acids.

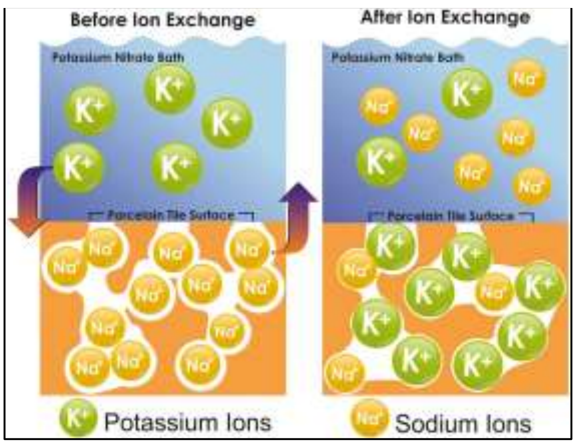

Figure 1: Exchange of sodium and potassium ions within porcelain surface

Thermal tempering

One of the most common method for glass strengthening is quenching or thermal tempering. Rapid cooling or quenching of a surface of an object while it is still hot creates residual surface compressive stresses on the surface of the ceramics. As the core is hot and soft and still in its molten state it tends to shrink and tries to pull the outer surface which is rigid now. On solidification, residual tensile stresses are created on the inner core and residual compressive stresses on the outer surface.[1]

Thermal compatability

Applicable in porcelain fused metal. The metal and ceramic should be selected such that there is a slight mismatch in their coefficient thermal contraction. This discripency causes the metal to contract slightly more during cooling. Thereby pulling the ceramic inward leading to compression of porcelain.

Dispersion strengthening of glasses

Dental ceramics that contains glass phase can be strengthened by dispersion strengthening i.e. dispersing ceramic crystals of high strength and elasticity such as leucite, lithium disilicate, alumina, magnesia-alumina, spinel, zirconia in the glass matrix.

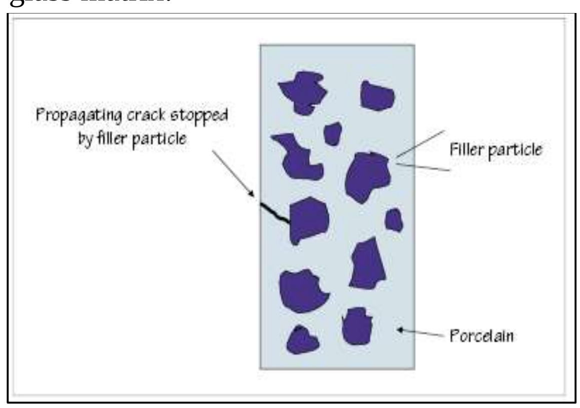

Figure 2: Filler particles like alumina dispersed in ceramic

Crystal particles prevent micro fractures to push on forward and it provides a strong structure.[2] Limiting factors while choosing reinforcing crystals are fusion temperature, coefficient of thermal expansion, bonding properties with dental porcelain, mechanical strength and resistance to thermal shock during rapid firing cycles.[3]

Optimum restoration design

Before designing a ceramic restoration which will cope with every negative condition, ceramic's weakness against low tensile strength, its fragility and sensitivity to micro fractures should be considered. In this design, ceramic should be protected from high tension. Avoid sharp edges and apparent thicknesses from restorations.[4,5] Best way to decrease the tensile strength on bridges is to design connector zones that have intense stress with an appropriate thickness and shape.[6] Stress raisers are discontinuities in ceramic restoration that can cause stress concentration. The design of the ceramic should avoid these stress concentrators. Abrupt changes in contour including any grooves, pits, notches can alter the stress flow lines. The internal angles in tooth preparation should not be sharp but rounded.[7]

Transformation toughening

Transformation toughening is a phenomenon, based on a phase transformation principal caused by tension strength. This method involve incorporating a crystalline structure usually partially stabilized zirconia which undergoes structural change under stress. When sufficient stress develops in the crystal and a crack in the area begins to propogate the metastable tetragonal phase transforms to the stable monoclinic phase and hence arresting the crack propogation.

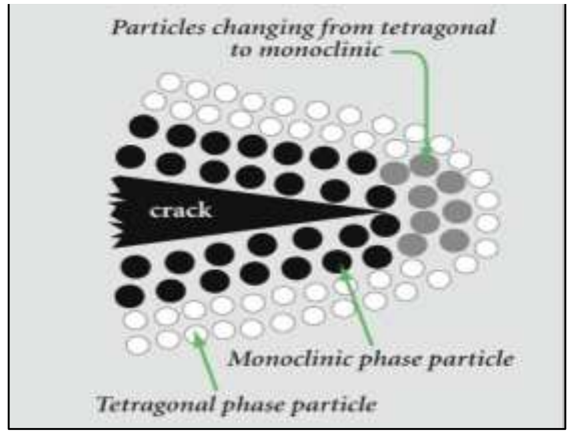

Figure 3: Inhibition of crack propagation

Minimizing the number of firing cycles

The purpose of porcelain firing procedure is to densely sinter the particles of powder together and produce a relatively smooth, glassy layer on the surface. Several chemical reactions occur over time at porcelain firing temperature: of particular importance is increase in concentration of crystalline leucite. Changes in the leucite content caused by multiple firing can alter the co efficient of thermal contraction of some porcelain products and produce stresses during cooling, sufficient to cause crack propagation in the porcelain.[8]

Shot peening

Shot peening is a type of surface treatment used to strengthen ceramics. It is a cold working process that shoots balls (shot) of steel, ceramics or glass beads at the workpiece to mechanically prestress the material surface beyond its yielding point.[9] The localized plastic deformation induces residual stresses into the surface region of the material. The surface residual stresses are compressive. The induced compressive residual stresses inhibit crack growth under both static and cyclic loading, increasing the material hardness, fatigue life and resistance to stress corrosion cracking.[10]

Other methods to improve strengthening

- Good condensation techniques (powder condensation),high pressure compaction, programmed firing schedules, vacuum fired porcelain and better condensation in the wet stage are essential to minimize shrinkage and avoid excessive air bubbles.
- If the surface is undisturbed, the strength of the glazed surface specimen is found to be higher.
- Strengthen with a metal substructure, Enamelling of high strength crystalline ceramics,Controlled crystallization of glasses and Crack tip blunting

Conclusion

It is apparent that ceramics as a material group would continue to play a vital role in dentistry owing to their natural aesthetics and sovereign biocompatibility with no known adverse reactions. However, there will always remain a compromise between aesthetics and biomechanical strength. In order to achieve adequate mechanical and optical properties in the final porcelain restoration, the amount of glassy phase and crystalline phase should be optimised. Good translucency requires a higher content of the glassy phase and good strength requires a higher content of the crystalline phase. Hence, the two material phases need to be balanced. Even though the material is high abrasion resistant, fracture toughness and resistance to the tensile stresses are inherent disadvantages. With the increased demand for more esthetic restorative materials, their biocompatibility and durability is of great importance. Even with the certain limitations ceramic can fulfill these criteria. The introduction of newer lab procedures and invention of new methods of strengthening ceramics have made them one of the superior restorative materials.

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Case Report

BULLOUS ORAL LICHEN PLANUS: A CLINICAL DILEMMA

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Abstract

Oral Lichen planus (OLP) is a common mucocutaneous disorder with multifactorial origin, often idiopathic with immune pathogenesis involving T-cells. The disease affects 0.5-2% of population with a female's predilection and the mean age of onset in the 4th-5th decade of life. Its chronic remitting and relapsing course with spontaneous remission making management of OLP a challenging for clinicians. Most OLP are asymptomatic, except the atrophic and erosive forms. As the treatment of OLP is challenging here we report a case of successful management of extensive, symptomatic bullous oral lichen planus with a novel treatment protocol- oral minipulse therapy with betamethasone.

Key Words: Oral lichen planus (OLP); Betamethasone; Oral minipulse therapy

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Introduction

Lichen planus (LP) is a relatively common, chronic, multifactorial, T – cell mediated, inflammatory disease that affects the skin, nails, hair, and mucous membranes.[1] Prevalence of oral lichen planus among Indian population is approximately 2.6%.[2] The disease shows a female predilection with a peak age of 30–60 years of which reticular type is the most common.[3]

In Bullous oral lichen planus (BOLP), concomitant formation of blisters is due to severe liquefactive degeneration of cells forming the basal layer (i.e., extensive inflammation) whereas the blisters formed in lichen planus pemphigoides (LPP) are because of circulating autoantibodies.[4] BOLP is commonly associated with burning sensation and pain, and the presence of bullae are seen in association with white striae.

Clinically, BOLP mimics erosive lichen planus as the fragile bullae formed can easily rupture, making the diagnosis more perplexing.[5] Here we report a case of bullous oral lichen planus along with its management.

Case Report

A 45-year-old female patient reported to the Department of Oral Medicine and Radiology with a chief complaint of ulcers on the hard palate for the past 6 months associated with burning sensation. Severe, continuous, insidious burning sensation which aggravated on having spicy food and preceded by eruption of fluid filled vesicles that would rupture within few seconds. Following rupture, the size of the ulcer gradually increased and healed within 3 weeks with new ulcers forming at different locations on the mucosa of the upper jaw. Similar lesions were noted on the hard palate which were associated with pain and difficulty in swallowing. No ulcers were seen elsewhere in the body. There was no known history of systemic disease, or history of any medication which could be related to the ulcers.

She had consulted many physicians and had taken several medications (multivitamin, escitalopram oxalate and clonazepam, itraconozole 100 mg, clotrimazole 0.1% oral paste, and acyclovir oral paste) with no marked relief in symptoms. She was also under medication for hypothyroidism for 4 years and had undergone several uneventful extractions of decayed teeth many years back. She also wears a complete maxillary denture which she is unable to use now. She does not report any similar condition in members of her immediate family. She reports a lot of stress and anxiety for which she is on medication. Further her oral hygiene was poor though she does not report any deleterious habit.

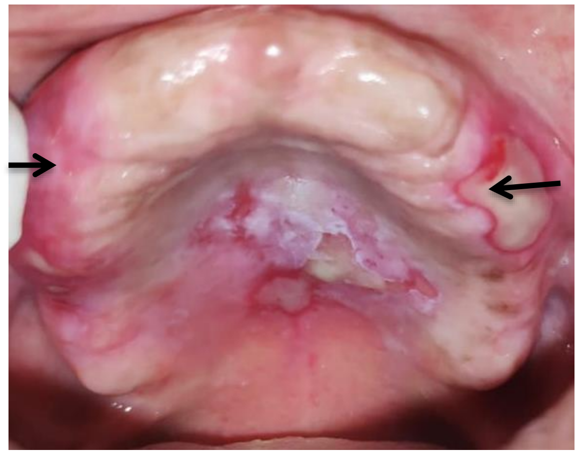

Figure 1: Lesions on alveolar ridge

On inspection of the alveolar ridge (figure 1), a single erythematous area was noted on the buccal aspect of the right edentulous maxillary alveolar ridge which extends from tooth 13 to tooth 16 region anterioposteriorly. There were multiple ulcers of varying sizes 0.5, 0.2 and 2cm in diameter with an erythematous halo present on tooth 16, 17 and 25- 26 regions respectively. Ulcers were of irregular shape and shallow with a yellowish white floor. Multiple erosive areas with white patches & ulcers were noted over the palate (figure 2) which extends anterioposteriorly 2 cm from incisive papilla to posterior palatal seal area.

The lesions were non scrapable, tender and bleeding was present on palpation. Base and margins of the ulcers were non- indurated and Nikolsky's sign was negative. There was no regional lymphadenopathy noted.

Figure 2: Lesion on palate

Figure 3: Punch biopsied specimen

Correlating the clinical history and presentation, a provisional diagnosis of "Pemphigus vulgaris" was made along with a differential diagnoses of bullous oral lichen planus, lichen planus pemphigoides, pemphigoid, allergic stomatitis, erythroleukoplakia, and erythematous candidiasis.

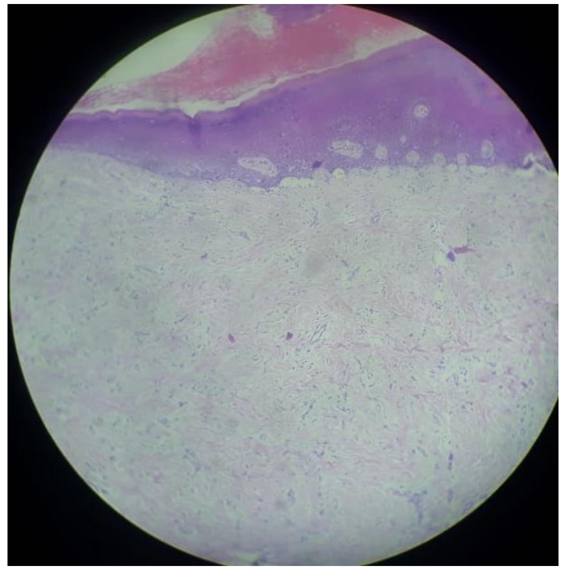

Figure 4: H & E shows subepithelial split with civatte bodies

Since there was limited information that could be gathered from the history and clinical examination, punch biopsy (Figure 3) and direct immunofluorescence were advised.

Microscopy showed epithelium with mild hyperkeratosis and subepithelial separation (Figure 4). The subepithelial zone shows melanin incontinence, civatte bodies and a mild lymphocytic infiltrate. Immunoflourescence showed linear deposits of IgG 2+ along the BMZ; however, IgA and C3 are negative On the basis of the histopathological features and clinical appearance a diagnosis of Bullous Oral Lichen Planus was made.

Treatment

Patient was advised to avoid using the denture during the treatment and was also instructed to undergo stress therapy. She was advised to take prednisolone 20 mg which was tapered over a period of one week. As she was unable to tolerate the bitter taste, prednisolone was substituted with betamethasone 0.5mg twice daily along with topical application of clobetasol 0.05%.

Figure 5: Lesion after 1 month

After a month's follow up, (Figure 5) the lesion seemed to reduce but fresh ulcers were found on the right alveolar ridge with candidal infection on the palate. Insomnia was also reported. Considering this, the regimen was changed to minipulse therapy, betamethasone 2mg once daily for three days/week for one month, cetirizine 5mg once daily, topical application of clobetasol 0.05% and clotrimazole 0.1%.

Figure 6: Lesion after 2 months

Figure 7: After skipping the dose

On the second month, (Figures 6,7) new bullae were noted on the alveolar ridge which were found to be due to her inability to adhere the regimen. On the third review, she reported puffiness of the face, fatigue and palpitations following which the dose was tapered to 1mg for one week and 0.5mg for another week. Subsequently the lesions subsided and steroid therapy was tapered, patient was advised to take medication on alternative days as maintenance therapy. The patient is still under follow up since a year and free of lesions (Figure 8).

Figure 8: After treatment

Discussion

Lichen planus is a chronic inflammatory autoimmune disease in which T – cells are generated against the basal keratinocytes, leading to its degeneration. The etiology of the lesion is not well defined although stress is a commonly associated factor in these patients. Cell-mediated immunity is mostly responsible for the pathogenesis of oral lichen planus (OLP). [6]

There are two variants of Bullous Lichen Planus (BLP): familial and non-familial. The familial variant is more common than the non-familial variant. Familial BLP occurs at an earlier age with longer duration of disease and more extensive eruptions, and increased tendency to involve nails when compared to non-familial variants. Pathogenesis of familial variants may be attributable to genetic factors.[7] The differential diagnosis of oral BOLP can be lichen planus pemphigoides, pemphigus, pemphigoid, allergic stomatitis, erythroleukoplakia, and erythematous candidiasis.[8]

The most widely accepted treatment for lesions of OLP involves topical or systemic corticosteroids to modulate immune response of patient.[9] The corticosteroids are most effective agents in the treatment of OLP, with topical agents being preferred over systemic drugs except during acute conditions. It is also uncomfortable to the patient to use topical medication frequently. Systemic corticosteroids, are useful during the acute conditions and are often used in combination with topical steroids. The following topical medications have been tried in the treatment of OLP: - Fluocinonide 0.05% in an adhesive base improved OLP with no adverse effects;[8] betamethasone showed effectiveness in symptomatic OLP in another study;[9] hydrocortisone hemisuccinate aqueous solutions had little benefit in treating OLP. [10]

In another study Acitretin was used as a first line therapy for BOLP with a dose of 0.5—0.7mg/kg administered until remission was achieved. A dose of 0.3—0.5mg/kg was given thereafter, either as monotherapy or in combination with topical or systemic corticosteroids (Topical application of tretinoin 0.025% in combination with Triamcinolone 0.1%).[11]

In the past few years, pulse therapy (PT) has been widely used in the treatment of various immunological and dermatological disorders. It was first described by Pasricha and Ramji in 1984. It is defined as discontinuous or intermittent intravenous infusion of very high doses of drugs over a short time. The aims of PT's are to achieve more rapid and effective disease control compared with conventional oral dosing, thus allowing a reduction in a long-term maintenance corticosteroids doses and their side effects. However, the patients on corticosteroids PT have to be continuously monitored in a set up because high dose of drugs are given. This may be particularly unnecessary in patients with only oral lesions without dermatological involvement. To overcome this problem, around 20 years ago a new therapeutic regimen called oral mini pulse therapy (OMP) were introduced allowing for oral administration of drugs with lesser dosages. [12]

It is also uncomfortable to the patient to use topical medication frequently. Systemic corticosteroids, are useful during the acute conditions and are often used in combination with topical steroids. The long-term side effects of systemic steroids are also common. In OMP therapy, corticosteroids have shown better efficacy with few and acceptable adverse effects, in diseases like vitiligo and alopecia areata. [12] OMP was used for the administration of betamethasone (5 mg) orally once daily for two consecutive days in a week for a period of three weeks to three months. In this case we use betamethasone 2mg orally once daily for 3 consecutive days in a week for two months. [13]

Conclusion

BOLP is a variant of OLP mimicking erosive OLP, pemphigus vulgaris clinically which makes the diagnosis more perplexing. OMP therapy is a better treatment modality to manage multivariant OLP lesions. The advantages of OMP are its convenient dosage schedule, efficacy, minimal side effects and no suppression cortisol production.

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