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Cover image showing root canal anatomy of a maxillary first molar tooth using India Ink Dye penetration subsequent decalcification, dehydration and immersion in methyl salicylate. Courtesy Department of Conservative Dentistry and Endodontics, Terna Dental College as part of ongoing original research project in the department.

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Case Report – Regaining Space And Attaining Occlusion Using Forced Eruption And Microimplants

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Abstract
A case report of a 16 year old male patient, with a chief complaint of chewing inefficiency and pain in the lower left quadrant of the mandible is presented. The patient had a cyst and multiple impacted teeth, which was treated with straight wire appliance with Temporary Anchorage Device (TAD).**(Terna J Dent Sci 2012; 1: 3-5.)**

Key words: - Impacted teeth, Micro Implants, Straight Line Appliance, occlusion

Introduction

We encounter some challenging cases in orthodontia. Pathological reasons are quite often responsible for displaced or impacted teeth leading to disturbance in development of normal occlusion.[1]

Early detection and removal of pathology may facilitate the proper eruption of dentition. We encountered one such case where a cyst in left arch of mandible led to the impaction of posterior teeth & extrusion of upper posterior teeth of the same side. This was treated by excising & removing the cyst, facilitating eruption of the premolar and intrusion of upper left posterior segment with Temporary Anchorage Device (TAD).[2,3,5,6]

Although conventional orthodontic mini screws have been used for skeletal anchorage in various types of treatment, they permit only limited force, vectors & ranges of tooth movement. In this case micro implant have been used effectively to get the intrusion of the posterior segment.[4]

Diagnosis And Treatment Plan

A 16 yr old male presented with the chief complaint of improper chewing on the lower left side of the jaw and occasional pain in lower left ridge. On clinical examination it was found that there was retroclination of upper anterior teeth, slight crowding in 43 region. [Fig.1/2/3] There was deep bite and class I molar relation on right side. Upper left posterior segment was extruded so much so that upper teeth were touching the lower left posterior ridge. The 31,35,36,37 and 38 teeth were clinically not visible in the oral cavity. 63 was present.

OPG showed palatally impacted 23 in an unfavorable position, impacted 31,35,36,37,38 teeth. [Fig 4] Tooth no. 75 was submerged and unerupted. Radiolucent pathology was present above impacted 36,37 teeth. The patient had a pleasing profile with competent lips. He was not interested in any correction besides the discomfort and lack of chewing efficiency in the lower left region.

It was planned to surgically remove the impacted 23 ankylosed 75 teeth and the pathological lesion above 36 and 37 teeth. It was decided not to disturb or to remove 36,37,38 as the inferior alveolar nerve was passing between the roots of all three molars. It was planned to place micro implants [5,6,7] in upper left posterior segment along with straight wire appliances. Lower appliances to be given to regain the space for impacted 31 and 35 teeth after surgical exposure. This was to be followed by extraction of 63 and Fixed Partial Denture (FPD) in 22,23,24 region and valplast Removable Partial Denture (RPD) in 36 and 37 region.

Treatment

After the surgical removal of impacted 23, ankylosed 75 and pathological lesion above 36 and 37 teeth, upper straight wire fixed appliance was given with .016 NiTi and RPD in 35,36,37 region was given. After a month upper arch wire was changed to .016 x .016 NiTi followed by .016 x .022 NiTi. .016 x .022 NiTi later was replaced by .016 x .022 SS along with micro implants placed between 24, 25 region and 26,27 region using self drilling method[9]. [Fig 5/6] The micro implants were then ligated tightly to the upper left posterior segment to help intrusion of the same. Palatal implant was placed between 26 and 27 region with palatal ligation with ligature wire to avoid flaring of 26,27 after placement of lingual buttons on 26 and 27 teeth[8]. [Fig 7] Lower arch was treated with .O16 NiTi to correct mild crowding in 43 region followed by .016 x .016 NiTi. Subsequently 016 x .016 SS along with coil spring was used to regain the space for impacted 31 tooth. After the space was regained surgical exposure of 31 tooth was carried out and later bonded and ligated to the main arch wire to bring it in position. [Fig 8/9/11]

After the 31 tooth was guided into position, surgical exposure of 35 was carried out and was subsequently bonded and engaged in .016 x .016 Niti after consolidating 34 to 46 region. [Fig 10/12/13]. Subsequently vertical elastics were given (Red) from lower premolar to upper premolar to help in eruption. After achieving eruption of the premolar, lower arch wire was changed to .016 x .022 SS.

The upper arch was finished with .018 x .025 SS wire with slight rocking chair effect. After attaining good occlusion and intercuspation the appliance was debonded and retention plates were given with replacement of 23. Finally 63 was extracted and replaced with a FPD and valplast denture in 36 and 37

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Fig 1

Fig 2

Fig 3

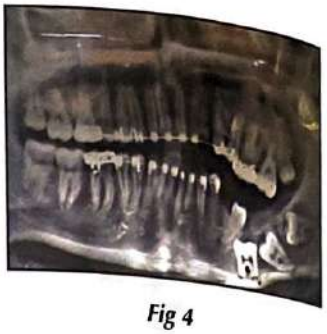

Fig 4

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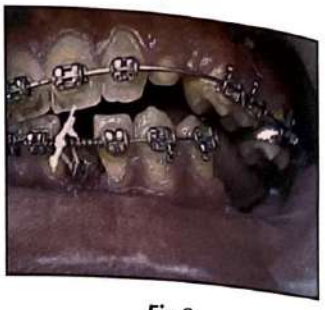
Fig 7



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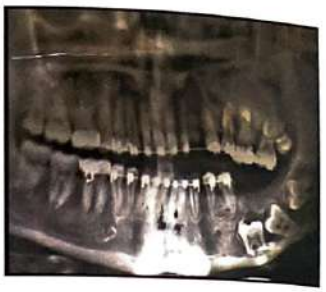

Fig 12

Fig 13

Fig 14

Fig 15

Fig 16

Fig 17

Fig 18

Fig 19

region [Fig 14/15/16/17/18/19] was given. Since there was gingival recession in 31 region the patient was referred to periodontist for gingival graft.

Discussion

Skeletal anchorage was used effectively to intrude the upper premolars & molars[3]. We used mini-screw implants placed both buccaly and palatally and forces directed on the occlusal surface to achieve a true intrusion. This facilitated in getting an occlusal clearance enabling us to get the premolar into occlusion and replacement of the molars.

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Periodontal Microsurgery

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Abstract
Optical magnification has broadened the horizons of dentistry in general and periodontics in particular. Improvement in visual acuity, made possible through optical magnification, is becoming an integral part of modern dental practices. High-powered magnification provides substantially more visual information for diagnosing and treating dental pathology compared to the use of unaided vision. In all phases of dentistry, the increased visual detail provided by high magnification reduces ambiguity in diagnosis and treatment decision-making, increasing control in treatment implementation. This article explains the concept of microdentistry, various components and clinical application specifically to periodontia are also discussed. **(Terna J Dent Sci 2012; 1: 6-8.)**

Key words: - Microsurgery, optical magnification, surgical microscope.

Introduction

Microsurgery involves procedures combining techniques of vascular surgery with an operating microscope, fine instruments, micro-sutures, new operative strategies and techniques. Microsurgery is gaining rapid popularity in the field of medicine with plastic surgeons and neurosurgeons predominantly employing this technique. It also promises to change periodontal surgery as of today. The primary advantage being reduced trauma to the tissues and subsequently relative painless technique, and hence it offers an alternative to conventional traumatic major surgery.

Microsurgery is broadly defined as "Surgery performed under magnification provided by the microscope"[1]. Serafin[2] described microsurgery as a methodology – a modification and refinement of existing surgical techniques using magnification to improve the visua-lization – that had implications and applications to all specialties, the implication being reconstructive surgeons have the ability to use microsurgical instruments and that these techniques would be superior to other techniques.

Tibbets[3] defined microsurgery as "Refinements in existing basic surgical techniques that are made possible by the use of the surgical microscope and subsequent improved visual acuity".

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The authors declare that there is no conflict of interest concerning the contents of the study.
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Advantages of Microsurgery

- Gentle handling of soft and hard tissues with the same universally accepted surgical principles.
- Highly accurate wound closure.
- Minimal tissue damage and trauma.
- Healing by primary intention.
- Clinical horizons will continue to improve with operator experience and willingness to employ previously unused basic optic magnification and ergonomic techniques and technology.
- Reduced pain

Magnification, illumination and micro-surgical instruments constitute a microsurgery triad. The microscope and new micro instruments specific to the needs of periodontal surgery have made the microsurgical approach a reality. The different components of the microsurgical unit are discussed in detail.

Magnification Systems

Today a wide range of simple and complex magnifying systems are available to dentists, allowing improvement in their clinical skills. The two types of magnification systems available to dentists are – magnifying loupes and operating microscope

Magnifying loupes:

It is one of the most common systems used in dentistry for enhanced vision. Loupes are fundamentally two monocular telescopes, with side by side lenses converged to focus on an object. However the clinician's eyes must converge to view the operative field and may result in eyestrain, fatigue and even pathologic vision changes, especially after prolonged use of poorly fitted loupes[4]

The three types of loupes which are commonly employed are simple, compound and prism loupes[5]

Simple Loupes[4,5]:

Simple loupes consist of a pair of single, positive, side by side meniscus lenses. They are primitive magnifiers with limited capabilities. Each lens has two refracting surfaces, with one occurring as light enters and the other when light leaves. Augmenting the lens diameter or thickness can increase the magnification. Their main advantage is its low cost. Because of their size and weight limitations they are of no practical dental application beyond the magnification range of 1.5 diameters, where working distances and depths of field are compromised.

Compound Loupes[4,5]:

Compound loupes use converging multiple lenses with intervening air spaces to gain additional refracting power, magnification, working distance and depth of field. Such loupes can be adjusted to clinical needs without excessive increase in size or weight. They are commonly mounted in or on eyeglasses.

Prism Loupes[4,5]:

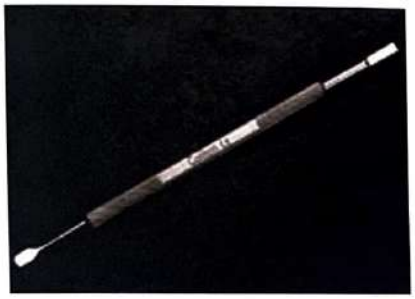
They are the most advanced optically loupe magnification systems. These loupes contain Schmidt or roof top prisms that lengthen the path through a series of mirror reflections within the loupes, virtually folding the light so that the barrel of the loupe can be shortened. Better magnification, wider depth of field, longer working distances and larger field of views are produced by these loupes. They can be

Loupes

Double Ended Rugine & Elevator

Surgical microscope

Chalazion Spoon



Rycroft Giradet Shovel

Endodontic microscope set-up

mounted on headbands or eyeglasses.

Loupes can provide a wide range of magnification (1.5X to 10X). For most periodontal procedures loupes of 4.0X to 5.0X provide an effective magnification, field size and depth of focus.

Surgical Microscope[6,7,8]**:**

The operating microscope offers a flexibility and comfort vastly superior to magnifying loupes. The operating microscope uses the application of magnifying loupes in combination with a magnification changer and a binocular viewing system. The parallel binoculars prevent eye strain and fatigue. Inclinable eyepieces lend a great flexibility that periodontal surgeries require to access the various anatomic structures in the oral cavity. The greatest advantage is its ability to allow the dentist to easily change the magnification to a level appropriate for the clinical task at hand. It also possesses an excellent coaxial fiberoptic illumination and accessories like still and video cameras for documentation[6,7,8]

Microsurgical Instruments

Microsurgery involves use of specially constructed smaller instruments designed specifically to minimize tissue trauma. Several types of ophthalmic knifes can be used in periodontal microsurgery with the advantage of extreme sharpness and minimal size. These instruments create clean incisions that prepare wounds for healing by primary intention. These incisions are established at a 90 degree angle to the surface using ophthalmic microsurgical scalpels (Castroviejo microsurgical scalpel)[3].

Applications in Periodontics

Microsurgery is a lesser invasive approach in surgery, thus causing lesser trauma to tissues and hence faster healing. It reduces the need for vertical incisions. Reduced incision size and reduced surgical retraction cause reduced post-operative pain and rapid healing of tissues[9].

By using microsurgical techniques, flap margins and closure can best be controlled by dissection of a uniform thickness periodontal flap that has a scalloped butt-joint margin. This facilitates precise adaptation of the tissue to the teeth of the opposing flap encouraging primary wound healing.

It has been demonstrated that root debridement performed without magnification, is incomplete and substantial deposits remain[10,11,12]. Magnification greatly improves the surgeon's ability to create a clean, smooth root surface thus permitting more definitive root debridement and enhancing the results of periodontal therapy. Wound healing studies show epithelial anastomosis of microsurgically joined surgical wounds in animals within 48 hours[13].

Periodontal microsurgery has proven to be effective in predicting gingival transplantation procedures used in treating recession with less operative trauma and discomfort. Root coverage procedures can be greatly enhanced with the use of microsurgery. Microsurgery offers the possibility of superior results due to the enhanced blood supply obtained by microsuturing[3,14].

The use of microsurgery also makes papilla reconstruction a realistic possibility[3,14]. Nordland et al[15] have reported 3 cases of microsurgical reconstruction of the dental

papilla. Conventional surgical techniques are unpredictable because of small working spaces and limited blood supply to the area. Vertical releasing incisions can further jeopardize vascular channels and leave unattractive scarring upon healing. The application of microscopes and microsurgical instruments presents a new frontier for predictable esthetic results.[15]

Conclusion

With rapidly increasing advancements in the field of surgery, Proficiency in periodontal micro-surgery is now becoming a necessity. Its benefits include improved cosmetics, rapid healing, minimal discomfort and enhanced patient acceptance. Thus microsurgery is offering newer possibilities improving the treatment outcomes of various periodontal treatment procedures.

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Diabetes Mellitus And Periodontitis – Finding The Link

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Abstract

The association between diabetes and periodontal diseases has long been discussed with conflicting conclusions. Both the diseases have a high incidence in the general population as well as a number of common pathways in their pathogenesis. With advances being made at a molecular level our understanding has become more profound. This article attempts to review the relationship to enhance our understanding of the link. (Terna J Dent Sci 2012; 1: 9-11.)

Key words: - Diabetes, Periodontitis.

Introduction

Historically, research concerning the relationship between diabetes and periodontitis focused on vascular changes in the periodontal tissues, granulocyte hypofunnction, increased tissue liability resulting from reduced collagen production or enhanced gingival collagenase activity and changes in oral microflora. The studies provided useful information concerning changes at the local level but failed to address possibility of the systemic relationship between diabetes and periodontitis. Recent investigations performed at the cellular and molecular level demonstrates common changes in the systemic physiology and has provided initial evidence of the potential mechanisms responsible for the observed associations.[1]

Classically diabetes presents with symptoms, which include polyphagia, polydypsia and polyuria. These are symptoms, which are a direct result of hyperglycemia and due to the resultant osmotic imbalance.[2]

Diabetes mellitus is associated with a wide range of complications that increase morbidity and mortality in affected individuals. The 5 major complications of diabetes include.

1. Retinopathy
2. Nephropathy
3. Neuropathy
4. Macro vascular disease.
5. Delayed wound healing.

These complications ensue from abnormal regulation of glucose metabolism that characterizes diabetes. In addition, an exaggerated inflammatory response to mediators such as lipopolysaccharide has been suggested to contribute to aggressive tissue damage in diabetic individuals. In this context, it has recently been demonstrated that, in diabetes, an up regulated proinflammatory monocytes response results in enhanced production of tumor necrosis factor-α, interleukin 1-β and prostaglandin E2, findings linked to increased severity of periodontal disease.[3,4]

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

This study has been self-supported by the authors.

Diabetes And Periodontal Disease

The sixth complication of diabetes has been recognized as periodontitis (Loe et al 1992). In examining the relationship between periodontitis and diabetes, it is prudent to consider the effects of diabetes on periodontitis as well as the effect of periodontitis on diabetes. There is evidence from studies carried out over the past few decades that the presence of diabetes increases the prevalence, incidence, and severity of periodontitis.

Two possible mechanisms have been proposed for their association.

1. The polyol pathway where glucose is reduced to sorbitol by the enzyme aldol reductase. Sorbitol is considered a tissue toxin and has been implicated in most of the complication of diabetes.

2. Production of advanced glycation end products (AGEs) due to nonenzymatic additions of hexoses to proteins. This alteration of many of the body proteins which includes collagen, hemo-globin, plasma albumin, lens protein, and lipoprotien, alters their function.

Mechanism Of Diabetes Influ-ence On The Periodontium[5]

A number of possible mechanisms have been proposed by which diabetes may affect the periodontium.

Gingival Crevicular Fluid (GCF) glucose levels

Increased blood glucose levels in, diabetes are reflected in increased levels of GCF glucose. In vitro, studies show decreased chemotaxis of periodontal ligament fibroblasts to Platelet Derived Growth Factor (PDGF) when placed in a hyperglycemic environment compared with normoglycemic conditions[5]. Thus, elevated GCF glucose levels in diabetes may adversely affect periodontal wound healing events and the local host response to microbial challenge.

Periodontal vasculature

Changes affecting the renal, retinal, and perineural vasculature in diabetes also occur in the periodontium. Increased thickness of gingival capillary endothelial celled basement membranes and the walls of small blood vessels may be seen in diabetic individuals. This thickening may impair oxygen diffusion and nutrient provision across basement membranes. Increased thickening of small vessel walls results in narrowing of the lumen, altering normal periodontal tissue homeostasis.

Formation of AGEs[5]

The formation of AGEs stimulates arterial smooth muscle cell proliferation, increasing thickness of vessel walls. Elevated LDL levels, especially common in type 2 diabetes, may cause changes in the gingival vasculature. The AGE modified arterial collagen in gingival blood vessel walls can

bind circulating LDL, resulting in atheroma formation and further narrowing of the vessel lumen.

Host response[5]

Altered host defenses have long been considered important in the pathogenesis of periodontitis associated with diabetes. Defects in polymorphonuclear leukocyte (PMN) adherence, chemotaxis, and phagocytosis have been observed in some individuals with diabetes. Many of these PMN abnormalities can be corrected with improved glycemic control. Defects affecting this first line of defense against subgingival microbial agents may result in significantly increased tissue destruction.

Collagen metabolism

Collagen is the primary constituent of gingival connective tissue and the organic matrix of alveolar bone. Changes in collagen metabolism contribute to alterations in wound healing and to periodontal disease initiation and progression. Increased collagen breakdown through stimulation of collagenase activity has been observed in the periodontium of diabetic patients[5].

Effects Of Periodontal Diseases On The Diabetic State

Periodontal diseases can have a significant impact on the metabolic state in diabetes. The presence of periodontitis increases the risk of worsening of glycemic control over time. In a 2-year longitudinal trial, diabetic subjects with severe periodontitis at baseline had a six-fold increased risk of worsening of glycemic control over time compared to diabetic subjects without periodontitis. Periodontitis may also be associated with an increased risk of other diabetic complications, as seen in a longitudinal case-control study in which 82% of diabetic patients with severe periodontitis[6] experienced the onset of one or more major complications such as cardio-vascular, cerebrovascular, or peripheral vascular events compared to only 21% of diabetic subjects without periodontitis. Because cardiovascular diseases are so widely prevalent in people with diabetes, a recent longitudinal trial examined the effect of periodontal disease on overall mortality and cardiovascular disease–related mortality in more than 600 subjects with type 2 diabetes. In subjects with severe periodontitis, the death rate from ischemic heart disease was 2.3 times higher than in subjects with no periodontitis or mild periodontitis, and the mortality rate from diabetic nephropathy was 8.5 times higher in the severe

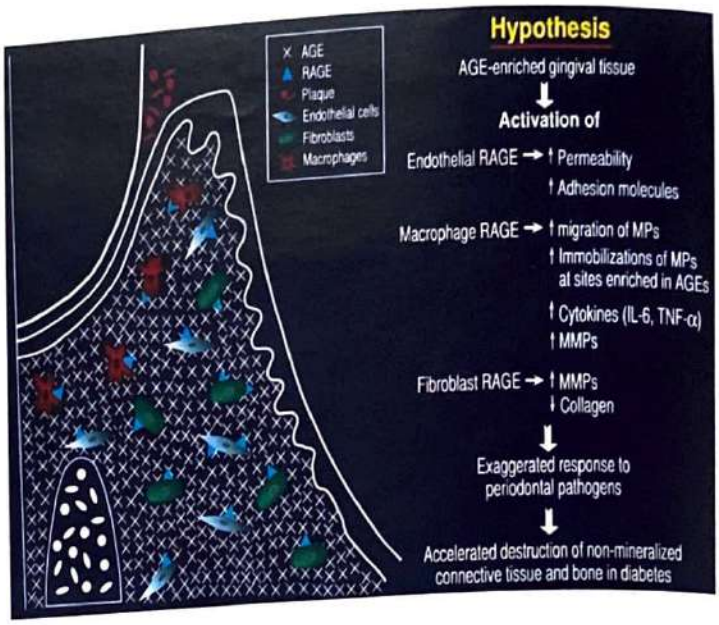

Fig 1:- Influence of AGEs and Receptors for Advanced Glycation End Products (RAGE) on diabetic periodontium. This figure summarizes the hypotheses regarding the potential role of enhanced AGE interaction with cellular RAGE in the pathogenesis of diabetes-associated periodontal disease. MPs: macrophages. IL-6: interleukin-6. TNF-a: tumor necrosis factor a. MMPs: matrix metalloproteinases

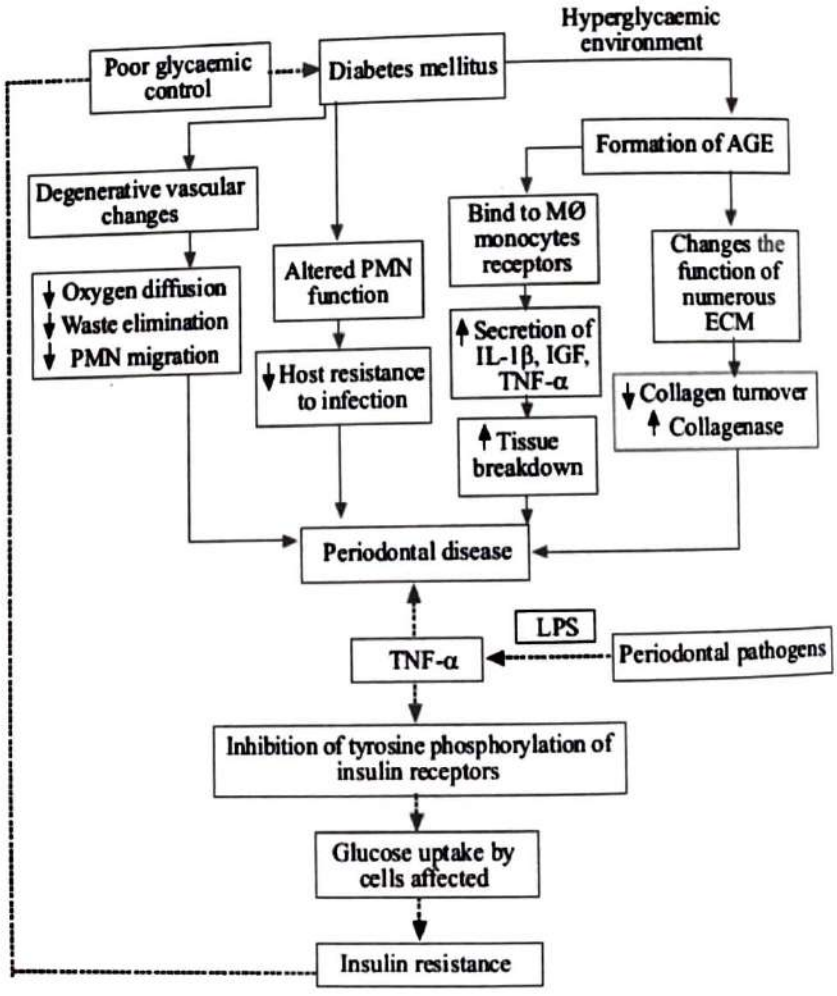

Fig 2:- Relationship between periodontitis and diabtes mellitus

periodontitis[6] group after accounting for other known risk factors. The overall mortality rate from cardio-renal disease was 3.5 times higher in subjects with severe periodontitis[6].

The effect of periodontal therapy on glycemic control is often mirrored by changes in clinical parameters of periodontal inflammation. For example, in a study of well-controlled type 2 diabetic patients with gingivitis or mild periodontitis, periodontal treatment was limited to scaling and root planing without systemic antibiotics. A control group of diabetic subjects with a similar periodontal status received no treatment. Three months after therapy, the treated subjects had a 50% reduction in the prevalence of gingival bleeding, from 55% of sites at baseline to 24% of sites post-treatment. These same subjects had a significant reduction in mean HbA1c from 7.3% to 6.5%. As expected, the untreated control group had no change in gingival bleeding 3 months after baseline (51% of sites at baseline; 52% post-treatment), nor did they have any improvement in HbA1c (baseline, 7.0%; follow-up, 7.3%). Thus, significant changes in glycemic control may accompany clinically evident improvement in gingival inflammation following periodontal therapy.[7]

Periodontal diseases may induce or perpetuate an elevated systemic chronic inflammatory state.[8] Acute bacterial and viral infections are known to increase insulin resistance in people without diabetes, a condition which often persists for weeks to months after clinical recovery from the illness. Such illnesses and resultant increases in insulin resistance in people with diabetes greatly aggravate glycemic control. Chronic gram-negative periodontal infections may also result in increased insulin resistance and poor glycemic control.[9]

Conclusion

Periodontal diseases and diabetes mellitus are closely associated and are highly prevalent chronic diseases with many similarities in pathobiology. Related antecedent conditions including obesity and insulin resistance may play an important role in this relationship.

Clinical Significance

The association between diabetes mellitus and periodontitis has always been discussed with conflicting conclusions. Both of these diseases have a relatively high incidence in general population as well as a number of common pathways in their pathogenesis. Clarification of this association is occurring as the diagnostic criteria for periodontitis and diabetes mellitus improve. Current studies[10-12] tend to support a strong association between diabetes and periodontitis. This relationship is clinically relevant not only at a diagnostic level but also at a therapeutic level, wherein treatment of one might help reduce the severity of another. Further research in this direction will help to establish the foundation of this cause effect relationship.

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Open Sandwich Technique

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Abstract
For a lesion that is entirely bound by enamel (i.e. intra – enamel lesion), preserving the dentin seal becomes a matter of establishing a lasting interface between the restoration and the tooth structure in esthetic restorations. In clinical practice, not all lesions are of this type and posterior proximal lesions commonly have gingival margins bounded by dentin. One of the viable solutions is the Open-sandwich technique. This technique is not new, but it deserves to be revisited, given the need for simplification and inability of newer materials to bond reliably and permanently to dentin substrates. Traditionally, Glass-ionomer cements (GIC) were used as the "filler" of the sandwich, but resin-modified GICs (RMGIC) have superior mechanical properties and bonding strength to dentin. Also, the open-sandwich technique allows the least amount of microleakage of various direct restorative options currently available. **(Terna J Dent Sci 2012; 1: 12-14.)**

Keywords: open sandwich technique, resin modified glass ionomer cement

Introduction:

With the introduction of glass ionomer cement in the early 1970s, Wilson and Kent appeared to have found a restorative material with excellent biocompatibility and the ability to self adhere to both enamel and dentin with a coefficient of thermal expansion like dental hard tissues and an ability to release fluoride[1]. Continued development and modification consisted of modifying particle size and distribution of the glass powder and the addition of a light curing resin[2]. Evolution of glass ionomer cement into an adhesive polymeric material has expanded and created a new dimension in treatment potentials for the progressive dental practice.

The 'sandwich technique' which combines the unique characteristics of glass ionomer cement and composite resin to form a monolithic restoration with complete reinforcement of the tooth is based on the principles of "biomimesis". This technique was first introduced and advocated by McLean and Wilson[3, 4, 5]. This technique is further divided into open sandwich technique and closed sandwich technique.

Closed Sandwich technique:

This technique is used when glass ionomer cement is placed in an area where there is no contact with the cavosurface of the preparation. The glass ionomer cement is completely covered with the composite restorative material. Dentin conditioning is not required with this technique.

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Open Sandwich technique[6, 7]:

This technique is used when glass ionomer cement is placed in an area where there is contact with the cavosurface on the preparation. The margin of the preparation is sealed with the glass ionomer material. A composite restorative material should always be used here and the dentin conditioner is indicated.

Class II Open Sandwich:

Used when any part of the gingival margin of a Class II preparation has been extended past the cementoenamel junction and no longer has an enamel cavosurface. The open sandwich technique involves replacement of dentin with an intermediate layer of glass ionomer cement so that it covers most of the exposed dentin and a bonded resin based composite is used as the enamel substitute[8].

Technique:

After removal of the caries (fig 1) and placement of the matrix (fig 2), the tooth [25] is conditioned with 10% polyacrylic acid according to the manufacturer's directions (fig 3), to remove the smear layer and improve bonding of enamel and dentin with glass ionomer. Resin modified glass ionomer cement is placed at the floor of the cavity (fig 4). Conventional self setting glass ionomer is not advised as etching of partially set glass ionomer filling will weaken its properties. Resin modified glass ionomer has superiority over conventional glass ionomer due to its command set by light cure. Total etch technique is employed (fig 5). The bonding agent is then applied (fig 6) followed by an incremental placement of a composite material (fig 7 & 8). In 26, mesial occlusal caries was excavated, matrix placed and followed by composite resin restoration.

Therefore, open sandwich technique is recommended when proximal gingival margins extend beyond the cemento-enamel junction[6, 7]. Use of light cure glass ionomer cement lining materials decrease chances of debonding as they achieve high early strength on photopolymerization[9].

Advantages:

i. Reduces bulk of composite resin in the cavity and subsequently polymerization shrinkage.
ii. Fluoride release from the glass ionomer cement at the cavity margin provides remineralization of affected dentin while inhibiting the demineral-ization of tooth structures adjacent to the restoration[9].
iii. Biocompatible as the technique is kind to gingiva in cases where the gingival seat is below the gingival margin compared to composite which is a potential irritant.
iv. No marginal discolouration as in amalgam fillings.

Fig 1: Removal of caries and isolation

Fig 2: Placement and adaptation of matrix and wedge

Fig 3: A 10% polyacrylic acid is applied to remove the smear layer.

Fig 4: Placement of resin modified glass ionomer cement to build up the enamel margin.

Fig 5: Etching of the tooth surface and the resin modified glass ionomer cement.

Fig 6: Placement of the adhesive/ bonding agent.

Fig 7: Placement of the first increment of the adhesive resin.

Fig 8: After initial polishing of the final increment of the composite resin

Fig 9: The completed esthetic restoration.

v. This technique provides an improved sealing ability by chemical or micromechanical adhesion[10], thus reducing microleakage and its consequences.
vi. Resin modified glass ionomer cements placed below composites decrease interfacial stresses by decreasing the volume of composite necessary for the restoration, hence economical[9].

Disadvantages:

i. It is believed that polymerization shrinkage of composite resin breaks the seal of glass ionomer cement to dentin[11].
ii. Less longevity as compared to crowns.
iii. Matricing is difficult in young children and hence may be difficult to use.

Current Concepts:

Light cured resin modified glass ionomer cements show slightly better performance as compared to chemically cured glass ionomer cement probably because of their ability to adhere immediately to dentin and achieve high early tensile and compressive strength[9].

Conclusion:

Thus, the combination of resin modified glass ionomer cement and composite resin in the treatment of the carious cervical restoration provides a monolithic restoration that provides an elastic region that is functional and esthetic while rendering it carious resistant. The improved properties of resin modified glass ionomer cements and composite resins have opened a new dimension in preventive and restorative dentistry. Although, neither resin modified glass ionomer cement nor composite resin has a monopoly on clinical success, the role of each material is not to replace, but to complement the restorative objectives.

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A Tooth For A Tooth Autotransplantation of Teeth : Current Consensus

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Abstract

Autotransplantation for years has been an established treatment modality to treat possible edentulous areas with a natural replacement. This article tries to encompass the various facets of autotransplantation of teeth; throw conclusive light on issues like case selection, status of roots, splinting techniques based on analysis of existing data and our personnel experience. The article highlights the change in the belief that third molars are trouble makers and are of no use. Here is the option were third molars have been upgraded and used as good masticatory apparatus by replacing extracted tooth by an natural tooth . **(Terna J Dent Sci 2012; 1: 15-18.)**

Keywords: Autotransplantation of tooth, Splinting, tooth ankylosis

Introduction

Autotransplantation of teeth is defined as the transplantation of embedded, impacted or erupted teeth from one site to another in the same individual into a extraction site or surgically prepared sockets

The introduction of endo-osseous implants have made the popularity of autotransplantation of teeth a distant second almost a forgotten one [1]. In our dept we have carried out auto transplantation of third molars.

At every follow up visit check for the following

- Stability of transplant
- Gingival recession
- Vitality test
- Occlusion
- Root formation, thickness of periodontal ligament,
- Root resorption in radiograph
- Oral hygiene

We try to analyze certain issues in the course of the procedure

1. Case selection

Younger patients were ideal candidates for the procedure since the bone mass volume (BMV) and density of the cancellous bone has been known to be better with improved turnover rate and robust immune system[2]. We found that patient in their second and third decades of life were ideal candidates for the procedure, though later are never a contraindication.

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2. Root status[3]

The status of the root to be auto-transplanted has easily been the subject of debate. Two schools of thought have been present with one advocating partially formed root to be ideal, since restoration of vitality of tooth and reduced chances of ankylosis is present. But this may increase the chances of developing a dentigerous cyst along side[4] and may be difficult to be effectively splinted. On the other hand completed root tooth are easier to be a atraumaticaly removed and splinted and osteointgrate well, but chances of ankylosis and the difficulties to provide a customized socket are to be looked as de-mirits.[5] Our experience suggests that tooth with complete or 3/4th root formation have better prognosis.

3. Socket preparation

Though it has traditionally not been advised to perform alvolotomies for such procedures certain experiences have now proved that the procedure of interdental alvelectomy/ alvelopalsty and socket widening may provide better mechanical support for the tooth to be auto-transplanted.[6] Though factors like thickness of the interdental bone and proximity to the Inferior Alveolar Nerves and Vessels have to be considered prior to socket preparation procedures.

4. Occlusion: Intercuspation v/s Infra occlusion

The choice of placing the transplanted tooth in occlusion or infra occlusion may be influenced by the kind of splinting used. Rigid splinting may necessitate the tooth to be at the level of the occlusion table of the adjacent tooth. While semi rigid splinting may permit the tooth to be in infra occlusion, thus enabling the tooth to self adjust, which is best suited for function in its new position or the socket. We have achieved enhanced prognosis when the tooth has been placed in infra occlusion and patient kept on soft diet[7].

5. Splinting : Rigid v/s Semi rigid

Various splinting techniques have been used in the past, including wire splinting, composite splinting/thermoplastic retainers[5] for rigid and semi rigid splinting respectively. Each of the technique comes with advantages and disadvantages, while semirigid splinting provide enhanced flexibility to adjust and adopt, the risk of rejection runs high, on the other side rigid splinting has greater risk of internal absorption secondary to ankylosis, a better occlusion leveling can be obtained from this. We preferred to splint the transplanted third molar to the tooth mesial to it using stainless steel wires only and keeping it out of occlusion.

6. Period of immobilization

A wait and watch strategy has been postulated to determine the period of immobilization. Periodic X-Rays including

The following is a photo series showing the steps of one such case

Fig 1.1 Case Selection Decayed 47 indicated for extraction and partially impacted 48

Fig 1.2 : Incision & Flap reflection

Fig 1.3 : Surgical removal of donor tooth(48) and Atraumatic Extraction of 47

Fig 1.4 : Donor tooth (48) kept in RL

Fig 1.5 : Closure, Wiring done after autotransplantation

Fig 1.6 : Post-op Radiograph (3 week)

Criteria	Need for Endodontic Treatment
Forming root (Incomplete Root)	No
Complete root with rigid splinting	Yes
Complete root with functional splint	NO - wait and watch
PDL space maintained	Optional
Ankylosed	YES

Table 1: Protocol to decide the need for endodontic treatment

IOPA, OPG are advised during immediate and late follow up period to analyze the amount of bone formation[8], the trabacular pattern of bone and also the viability of the periodontal ligament. A broad consensus on this subject indicates an average of 3-4 weeks as sufficient if rigid splinting has been used and a additional of a week if semi rigid splinting has to be used. If the tooth is mobile and non vital for a period of more than 5 weeks it can be assumed that the procedure has failed and the tooth should be extracted to prevent infection. We have evaluated the tooth for radiological changes like PDL widening, radiolucency around the tooth, and clinically for mobility and tenderness. We have got satisfactory results for immobilization of the tooth for a period of 3 weeks.

7. Necessity of endodontic treatment

Endodontic rehabilitation of transplanted teeth has been extensively discussed in literature. Through an extensive search of literature and personal experience we propose a protocol to decide if endodontic treatment is required or not (Table 1). Tooth with incomplete root formation may not require endodontic treatment, while tooth with completed root may require endodontic treatment based on the kind of splinting technique used. Tooth splinted with rigid splinting may require endodontic coverage; semi rigid splinted tooth may not. If post operative PDL space is neither obliterated nor widened, then endodontic treatment can be postponed until definitive need arises. Ankylosed tooth-sure shot call for endodontic intervention[9]. The in vitro

Steps	Observations, Notings & Records of the patients		
Step1 Pre-op	Patient	Age Sex Medical History Smoking Facial Skeleton	
	Donor tooth	Type of Impacted tooth Pocket depth State of Eruption Contact with opposing tooth	Intraoral photographs Study models Interocclusal records OPG & IOPA
	Recipient Site	History of Dental caries History of restoration History of RCT Duration of absence of teeth	
Step 2 Operation		Number of roots of the donor tooth Root fracture of donor tooth at removal Number of interradicular septum Positional relation of donor tooth & recipient site Need to adjust the donor tooth to the recipient site Fixation / Splinting	IOPA & OPG
Step 3a Early Post-op	1,2 weeks	Initial healing Duration of endodontic treatment Pocket depth Root resorption Bone regeneration	IOPA
Step 3b Late Post-op	3,6 & 9 weeks	Bone growth Bone morphology PDL space Tenderness Mobility	IOPA & OPG

Table 2 : Protocol for Autotransplantation of tooth

time of the donor tooth also is a deciding factor for need for endodontic treatment.

Prognostic factors:

The success of autotransplant has been judged by various parameters & the prognosis of auto transplanted tooth depends on the procedure and case selection. Meticulous planning and implementation of absolute sterile procedures is definitely a plus point. We propose to put forward a protocol (Table 2) followed at our unit for the procedure based on the best practices followed for the procedure. The records and noting were made for each step.

Conclusion:

Transplantation of the tooth is indeed a valuable option for replacement of missing teeth. It comes with the unique advantage of maintaining the health & growth of the alveolus in tandem. If performed judiciously with meticulous planning autotransplant may be a better option than endoosseous implant, but only if such donor tooth is available. Case selection and patient compliance and periodic follow up are still the most important prognostic factors. At our unit we are presently exploring the option of autotransplanting a tooth across the different arches. While we are at the brim of cutting edge research and medical technology nothing can beat the replacement of a tooth by a natural tooth.

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Oral Telengiectactic Granuloma: A Case Report

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Abstract

Telangiectatic granuloma is a common reactive neoformation of the oral cavity, which is composed of granulation tissue and numerous blood vessels and develops in response to local irritation or trauma. The most widely used term is pyogenic granuloma, although it does not adequately describe the lesion's characteristics. The term "pyogenic" implies pus production related to an infectious aetiology; however, no pus-producing microorganisms are associated with pyogenic granuloma. Moreover, the lesion is not a true "granuloma" (i.e. a specific type of persistent chronic inflammation). This paper presents a case of telengiectactic granuloma emanating from the attached gingiva (upper right posterior region of the jaw). **(Terna J Dent Sci 2012; 1: 19-20.)**

Key Words: Telengiectactic granuloma, Reactive hyperplasia, Hormonal imbalance.

Introduction

Telengiectactic granuloma is one of the reactive hyperplasias seen in the oral cavity as a tissue response to irritation, trauma or hormonal imbalances. It is a common benign growth seen on the skin and oral cavity. The first case was reported in 1844 by Hullihen as "pyogenic granuloma" or "granuloma pyogenicum", which was coined only in 1904 by Hartzell. It predominantly occurs in females in second decade of life. Vilmann et al (1986) described that pyogenic granulomas can be of few millimetres to several centimetres in size and commonly involves maxillary labial gingiva.[1-4] Uncommonly it can occur on the lips, tongue, buccal mucosa, palate and so on. This article describes a case of telengiectactic granuloma and discusses the clinicopathological features of this tumor.

Case Report

A sixteen year old female patient reported with a complaint of difficulty in mastication and localized swelling of the gingiva in the upper right posterior region of the jaw. The growth was of negligible size when the patient first noticed it and has grown gradually over a period of an year to attain the present size. Patient gave no history of trauma; no cervical and submandibular lymph node enlargement was noticed. Intraoral examination revealed full complement of teeth. The patient's medical and family history was not significant.

Intraorally there was a reddish pink pedunculated exophytic growth approx 3x2cms in size arising from the attached gingiva in relation to 14, 15 and 16. The lesion was firm on palpation and frequently bled on provocation. There were areas of indentation and ulceration on the surface of the growth. With the above said findings, provisional diagnosis of pyogenic granuloma was established. Complete hemogram revealed no significant findings. Since the growth was causing hindrance in mastication, an excisional biopsy was carried out under antibiotic coverage of amoxicillin 500 mg thrice daily for 5 days.

Histopathological report showed a band of connective tissue made up of fibrovascular reactive tissue consisting of abundant young proliferating blood capillaries, filled with red blood cells, numerous plump active fibroblasts densely infiltrated with both acute and chronic inflammatory cells. Post excision period was uneventful with regular follow up at one monthly interval showed no evidence of recurrence.

Discussion

The so called telengiectactic granuloma is a polypoid form of capillary hemangioma on the skin & mucosal surfaces. The inflammatory changes that often accompany these tumors may be so pronounced that the lesion bears a striking resemblance to granulation tissue.[1] Poncet & Dor in 1897 described pyogenic granuloma as granuloma pyogenicum. Over the years various authors have suggested other names such as granuloma gravidarum, pregnancy tumors, Rocker & Hartzell's disease, vascular epulis, benign vascular tumors, epulis telangectium granulo-matousa, & lobular capillary hemangioma. An intravenous counterpart of pyogenic granuloma was recognized by Cooper et. al. This tumor is most common on the neck & upper extremity. It presents as a red-brown, intravascular polyp that can be easily mistaken for an organizing thrombus[5]. The pregnancy Granuloma Gravidarum or 'pregnancy tumor' is a tumor specialized form of pyogenic granuloma that occurs on the gingival surface during pregnancy. The precise mechanism for the development of telengiectactic granuloma is unknown. Trauma, hormonal influences, viral oncogenes, underlying microscopic arteriovenous malformations, the production of angiogenic growth factors & cytogenic abnormalities have all been postulated to play a role. The over expression of transcription factors, P-ATF2 & STAT3 also may play role in tumorogenesis.[6,7]

Histologically, telengiectactic granulomas show a highly vascular proliferation that resembles granulation tissue. The surface is usually ulcerated and shows fibrinous exudates over the surface. Vast numbers of endothelial lined vascular spaces are seen. A

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Fig 1:- Intraoral photograph of the lesion.

Fig 2:- Excised macroscopic tissue in toto.

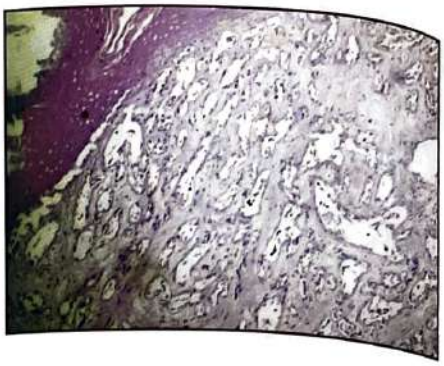

Fig 3:- Histopathology section showing dilated vascular spaces containing RBCs and moderate amount of chronic inflammatory cell infiltrate.

mixed inflammatory cell infiltrate of neutrophils, plasma cells and lymphocytes is evident. Mature lesions may have areas with a more fibrous appearance. Differential diagnosis of telengiectactic granuloma includes peripheral giant cell granuloma, peripheral ossifying fibroma, heman-gioma, peripheral fibroma, and pregnancy tumor. Surgical excision is the treatment of choice for telengiectactic granuloma. Although these are reactive hyperplasias, they have a relatively high recurrence rate of 16% after simple excision whereas, recurrences after surgery of extragingival pyogenic granulomas is however uncommon. Elimination of the causative agent is required.

Recently, some other treatment protocols like Nd:YAG lasers, cryosurgery, electrodissection have also been proposed.[8] Recurrences is believed to result from incomplete excision, failure to remove etiological factors or reinjury to the area. Some recurrences manifest as recurrent deep satellite nodules (Warner-Wilson Jones syndrome). It should be emphasized that gingival cases show a much higher recurrence rate than lesions from other mucosal sites.[2]

Conclusion:

Prevention of recurrent or newly-developed lesions of Telengiectactic granuloma entails complete removal of the causative traumatic insult. For gingival lesions, implementation of meticulous oral hygiene is of paramount significance. In cases that dental restorations and appliances, or tooth and periodontal abnor -malities are implicated, these factors should be corrected or eliminated. The adoption of preventive measures during pregnancy, such as better oral hygiene, will reduce the risk of pregnancy-associated Telengi-ectactic granulomas.

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An Update In Early Cancer - Precancer Detection And Associated Risk Factors

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Abstract

In India, oral cancer constituting 9.8% of an estimated 644600 incident cancer cases in 1992, ranks first among all cancer cases in males and is the third most common among females. In the United States, cancers of the oral cavity and oropharynx represent approximately three percent of all malignancies in men and two percent of all malignancies in women. Over 90 percent of these tumors are squamous cell carcinomas, which arise from the oral mucosal lining. In spite of the ready accessibility of the oral cavity to direct examination, these malignancies still are often not detected until a late stage, and the survival rate for oral cancer has remained essentially unchanged over the past three decades. The purpose of this article is to review the clinical features and risk factors of oral cancer and oral precancerous lesions, with an emphasis on early detection. **(Terna J Dent Sci 2012; 1: 21-24.)**

Keywords: Oral cancer, Precancer, Early diagnosis

Introduction

The incidence of squamous cell carcinomas of the oral cavity differs widely in various parts of the world and ranges from 2-10 per 100000 population per year. Such differences can, to some extent be explained on the basis of environmental differences or lifestyle and habits among certain populations such as betel quid chewing, snuff dipping or the habit of reverse smoking. In India, cancer of oral cavity is one of the five leading sites of cancer in either gender. On the basis of cancer registry data, it is estimated that annually 75000-80000 new oral cancer cases develop in India. The majority of oral cancers are unequivocally associated with tobacco chewing habits and usually preceded by premalignant lesions.[1]

Oral leukoplakia, erythroplakia and oral submucous fibrosis have been reported to show an increased risk of malignant transformation. Dental practitioners come across many red and white lesions and must be able to recognize 'at risk' lesions which will help in early diagnosis and treatment planning of oral cancer. The purpose of this article is to review the risk factors and clinical features of oral cancer and oral precancerous lesions, with an emphasis on early detection.

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Risk Factors

The strong association between cancers of the oral cavity and pharynx with tobacco use is well established. Epidemiological studies show that the risk of developing oral cancer is five to nine times greater for smokers than for nonsmokers[2,3,4]. In addition, treated oral cancer patients who continue to smoke have a two to six times greater risk of developing a second malignancy of the upper aerodigestive tract than those who stop smoking[5].

In India and Southeast Asia, the chronic use of betel quid (Paan) in the mouth has been strongly associated with an increased risk for oral cancer. The quid typically consists of a betel leaf that is wrapped around a mixture of areca nut and slaked lime, usually with tobacco and sometimes with sweeteners and condiments. The slaked lime results in the release of an alkaloid from the areca nut, which produces a feeling of euphoria and well-being in the user. Betel quid chewing often results in a progressive, scarring precancerous condition of the mouth known as oral submucous fibrosis which has been associated with a very high malignant transformation rate (8%) in India.[1,2,6,7]

Snuff and chewing tobacco have also been associated with an increased risk for oral cancer.[8] In one study of women in the southern United States, chronic users of snuff were estimated to have a four times greater risk of developing oral cancer.[9] In addition, a significant number of oral cancers in smokeless tobacco users develop at the site of tobacco placement. However, the use of smokeless tobacco appears to be associated with a much lower cancer risk than that associated with smoked tobacco.[2]

Alcohol use has been identified as a major risk factor for cancers of the upper aerodigestive tract. In studies controlled for smoking, moderate-to-heavy drinkers have been shown to have a three to nine times greater risk of developing oral cancer. Of even greater significance is the synergistic effect of alcohol and smoking; some subsets of patients who are both heavy smokers and heavy drinkers can have over one hundred times greater risk for developing a malignancy.[10,11]

Recent evidence suggests that human papillomavirus (HPV) may be associated with some oral and oropharyngeal cancers. HPV-16 has been detected in up to 22 percent of oral cancers, and HPV-18 has

Figure 1: Leukoplakia

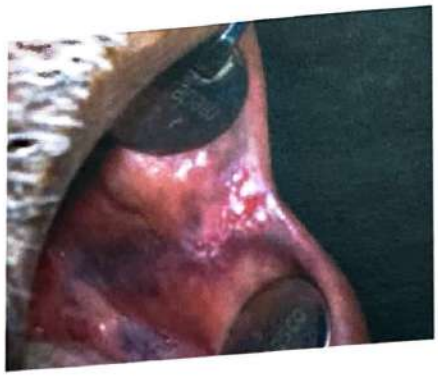

Figure 2: Erythroplakia

Figure 3: Lichen planus

Figure 4: Oral submucous fibrosis

Figure 5: Squamous cell carcinoma

been found in up to 14 percent of cases.[12,13] Dietary factors, such as a low intake of fruits and vegetables, may also be related to an increased cancer risk.[14]

Iron deficiency anemia in combination with dysphagia and esophageal webs (Plummer-Vinson or Paterson-Kelly syndrome) is associated with an elevated risk for development of carcinoma of the oral cavity, oro-pharynx, and esophagus.[15] Immunosuppression appears to predispose some individuals to an increased risk for oral cancer. Carcinomas of the lip have been reported in a number of kidney transplant patients receiving immunosuppressive medications, and oral carcinomas have been documented in young AIDS patients.[16]

Clinical Presentation

Precancerous lesion is a "morpho-logically altered tissue in which cancer is more likely to occur than in its apparently normal counterpart", and precancerous condition is a "generalized state associated with significantly increased risk of cancer" (WHO)[1]

The most commonly encountered precancerous lesions in the oral cavity are leukoplakia and erythroplakia (Figure 1 & 2, Risk of malignant transformation- 4 to 6%). Early or thin leukoplakia appears as a slightly elevated grayish-white plaque that may be either well defined or may gradually blend into the surrounding normal mucosa. As the lesion progresses, it becomes thicker and whiter, sometimes developing a leathery appearance with surface fissures (homogeneous leuko-plakia) Some lesions develop surface irregularities and are referred to as granular or nodular leukoplakia.[2]

Oral erythroplakia occurs most frequently in older men and appears as a red macule or plaque with a soft, velvety texture. Often the lesion is well demarcated, but some examples may gradually blend into the surrounding mucosa. Some lesions may be intermixed with white areas (erythro leukoplakia). Erythroplakia is often asymptomatic, although some patients may complain of a sore, burning sensation.[2,3]

Lichen planus and oral submucous fibrosis are commonly encountered premalignant conditions of the oral cavity (Figure 3 & 4). Lichen planus is a relatively common chronic dermatologic disease that often affects oral mucosa (very low malignant potential, 0.3-3%). Lesions are characterized by radiating white or gray, thread like papular lesions that form typical streaks mainly over buccal mucosa.[1,2]

Oral submucous fibrosis is a chronic, progressive, scarring high risk precancerous condition seen primarily in Indian population. (Malignant potential - 7.6 %) The chronic use of betel quid (Paan containing areca nut) in the mouth has been strongly associated with an increased risk for oral submucous fibrosis. It is first noted in young patients whose chief complaint is an inability to open mouth, often accompanied by mucosal pain while eating spicy food. Mucosa in affected areas show marble like appearance leading to progressive stiffness.[1,2]

Early Diagnosis

Despite the great strides that have been made in recent decades to improve the prognosis for a number of cancers throughout the body, the prognosis for oral cancer has not experienced a similar improvement.[17] Because five-year survival is directly related to stage at diagnosis, prevention and early detection efforts have the potential not only for decreasing the incidence, but also for improving the

survival of those who develop this disease. Early diagnosis depends upon an astute clinician or patient who may identify a suspicious lesion or symptom while it is still at an early stage. However, it is apparent that many clinicians, including dentists and physicians, may not be knowledgeable about the risk factors, diagnosis, and early detection of these cancers and/or are not performing routine oral cancer examinations.[18]

Diagnosis of leukoplakia is made when adequate clinical and histological examination fails to reveal an alternative diagnosis and when characteristic histopathologic findings for leukoplakia are present. Important clinical criteria include location appearance, known irritants, and clinical course. White lesions can mimic leukoplakia clinically and should be ruled out before a diagnosis of leukoplakia is made. (Eg. lichen planus, lesions caused by cheek biting, frictional keratosis, smokeless tobacco–induced keratosis, nicotinic stomatitis, leukoedema, etc.)[19]

If a leukoplakic lesion disappears spontaneously or through the elimination of an irritant, no further testing is indicated. For the persistent lesion, however, the definitive diagnosis is established by tissue biopsy. Adjunctive methods such as vital staining with toluidine blue and cytobrush techniques are helpful in accelerating the biopsy and/or selecting the most appropriate spot at which to perform the biopsy.[19]

Toluidine blue staining uses a 1% aqueous solution of the dye that is decolorized with 1% acetic acid. The dye binds to dysplastic and malignant epithelial cells with a high degree of accuracy. The cytobrush technique uses a brush with firm bristles that obtain individual cells from the full thickness of the stratified squamous epithelium; this technique is significantly more accurate than other cytological techniques used in the oral cavity. It must be remembered that staining and cytobrush techniques are adjuncts and not substitutes for an incisional biopsy.[19]

Early oral cancers and precancerous lesions are often subtle and asymptomatic. Therefore, it is important for the clinician to maintain a high index of suspicion,

especially if risk factors such as tobacco use or alcohol abuse are present. As the cancer develops, the patient may notice the presence of a nonhealing ulcer. (Figure 5) Later-stage symptoms include bleeding, loosening of teeth, difficulty in wearing dentures, dysphagia, dysarthria etc.[2]

Since most individuals are seen commonly by primary care physicians and general dentists, it is important for clinicians to perform screening examinations to identify potential oral cancers. When a suspicious lesion is identified, a conventional scalpel biopsy or punch biopsy remains the best and most accurate means of assessing it. The biopsy can be obtained by the general dentist or specialists (Oral and Maxillofacial Surgeon or Oral and Maxillofacial Pathologist etc). In addition to the need for improved early detection by clinicians, it is also important that the patient and general public are knowledgeable about the disease. Delays in identification and recognition of suspicious lesions contribute to advanced stage at diagnosis and lower survival statistics.[2]

Conclusion

The ability to control oral cancer will depend on two cornerstones: prevention and early diagnosis. Continuing educational campaigns are needed on the local, state, and national level in order to educate the public about the risk factors and early signs/symptoms associated with this disease. Individuals also need to be encouraged to seek regular professional oral examinations by a dentist and/or physician. Finally, health care workers must be encouraged to perform oral cancer examinations as part of their patient care regime, and to be knowledgeable about early signs of oral carcinoma.[20]

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Determinants of Self Rated Oral Health

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Abstract

Health for all is perceived as a wellbeing, which incorporates physical, social, emotional, cultural and spiritual wellbeing within a community framework. Self-rated health is a useful measure of people's general health and was found to predict future health outcomes. Self-rated oral health is a similarly useful measure of people's oral health. Both these measures are helpful in estimating the quality of life of an individual .The paper highlights on the various determinants of self rated oral health. It uses subjective as well as clinical measures to estimate the self rated oral health. The socioeconomic determinants are complex and interact with other factors such as environmental and political factors. The article focuses on these determinants in detail using a theoretical framework and evidences from other studies conducted. **(Terna J Dent Sci 2012; 1: 25-27.)**

Key words: Self Rated Oral Health, Socio Economic Determinants

Introduction

Health for all is perceived as a wellbeing, which incorporates physical, social, emotional, cultural and spiritual wellbeing within a community framework[1]. Oral health is fundamental to overall health, well-being and quality of life[2]. It provides a wealth of information of general state of body, which can be derived by examining the mouth and surrounding tissue. Health and well being are generally recognized to be a combination of complex factors like social, economic, and cultural circumstances[1]. Difference in health impact occurs through interaction of people with these complex determinants. Measures of perceived oral health represent subjective individual perspectives of one's health. It also varies across different ethnic and racial groups[3].

The widespread studies conducted in the past most frequently use a single question as a measure to rate the overall health of people on a scale from excellent to poor. The strongest predictor of morbidity and mortality can be answered by this single question of Self Rated Health (SRH) even after controlling for a variety of physical, socio-demographic and psychosocial health status indicators[4]. Despite its use in medical studies, a single question of Self Rated Oral Health (SROH) has been seldom used as the primary outcome in dental studies.

According to Atchison and Gift[3] the term SROH is used to describe many different measures for example, indications of quality of life such as satisfaction with oral health, self-reported role limitations and avoidance of conversation due to problems with teeth or dentures. Other subjective measures of esthetics or satisfaction with one's appearance, represent another dimension of perceived oral health that emphasizes the importance of oral health with respect to the patient's self-image. Measures of perceived oral health can also be the state of teeth, gums or associated oral health condition of soft and hard tissues.

Conflict of interest and source of funding

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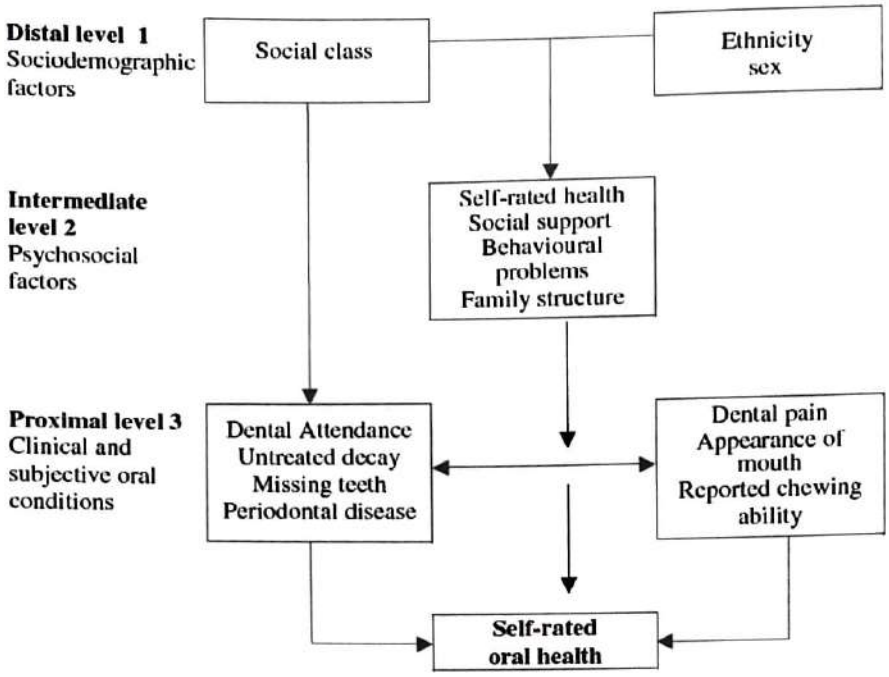
Importance Of Measuring Self Rated Oral Health (SROH)

The main factors associated with SROH include both clinical which are objective and subjective oral factors. Clinical factors include dental decay, missing teeth, bleeding gums and dental care. Subjective measures include reported general health, appearance of mouth and dental pain. In addition, studies have shown that the demographic and socioeconomic variables such as gender, age and social class have been associated with SROH[4]. There are several reasons for investigating lay people's perceptions of their dental health. First self-reporting is a routine procedure undertaken during the diagnostic procedure performed by the clinicians. Secondly, assessment of treatment needs requires information not only related to professional needs but also about perceived common peoples need for day to day life[5]. Thirdly, assessing self-rated oral health status is relatively simple and it may be an easier and complementary method to collect dental information on adolescents and adults[5]. Fourthly, it can be a useful tool for planning and monitoring health services and health promotion interventions[7].

Theoretical framework of the determinants of SROH in adolescents[4] (figure 1)

A study was done to investigate the main social, psychosocial and clinical factors associated with poor SROH by adolescents in Brazil[4]. It introduced a theoretical framework to explain the relationship between different variables. (Figure 1) The framework introduces a conceptual model to explain SROH and helped to identify the domains that are assessed by a single self-rated oral health measure in adolescents. It shows that, in a population, good SROH was related to socioeconomic factors, perceived general health and mouth appearance, and on objective clinical factors such as presence of untreated dental decay or perio-dontal disease.

Another study done by Benyamini Y et al[8], studied the relationship between oral health, health and health related quality of life. "Oral health has generally not been assessed



Determinants of Self Rated Oral Health works at three levels:
Sociodemographic factors (social class & ethnicity, sex), Psychological factors (social support, Behaviourial problems & family structure), Clinical & subjective oral conditions. Self Rated Oral Health is a useful diagnostic tool which uses subjective as well as clinical measures both from patient and a health professional perceptive. If used as an assessment tool, it would help for better understanding of patient's need, effective provision of oral health services, planning and monitoring of health services and health promotion interventions.

as a component of general health-related quality of life instruments[9]. Indeed, investigations of oral health as a component of general health status, and in particular of self-rated were not common. The outcome variables were SRH, self esteem and life satisfaction. In the study, participants were old people and had single-item self-ratings of general and oral health, self-reports of medical history, recent chronic diseases, medication usage, functional disability, self esteem and life satisfaction. Older persons' well being is dependent, among other things, on their health and functional ability[8].

Oral health is one of the domains of health that can affect functioning and hence the overall feeling of health. According to Cushing's[10], Slade and Spencer[11] oral health problems can result in pain and discomfort and lead to problems in eating, communication, and appearance, and consequently to embarrassment, social problems and low self-esteem particularly among older adults. In a review of the relationships between oral health, health, and health-related quality of life, Gift and Atchison[9] concluded that when oral health is compromised, overall health and quality of life may be diminished.

The finding from US on oral health care system undertaken as an international collaborative study by World Health Organisation (WHO)[12] suggests that dental care delivery system factors were not the primary determinants of oral health status. Greater availability of manpower and access to dental services did not appear to be the most important determinants of better oral health status. Researchers concluded that other factors, such as the population's oral health beliefs, personal health practices, and the commitment of a country and its dental profession to implementing prevention activity, might be of equal or greater importance[13]. The study was based on looking at the standard oral health indicators among different racial – ethnic groups.

A social view of health focus is based on the idea that condition of a healthy individual not necessarily means absence of disease but having a health promoting environment where people live and work. It works on multidimensional principle. These scientist are now focusing on the concept of social capital as a possible explanation. Kawachi et al[14] used US data aggregated at the state level and reported strong cross-sectional correlations between indicators of social capital and mortality rates. They tried to control for a range of individual-level factors that predict health, including household income, race, health insurance coverage, and lifestyle behaviors.

The study undertaken by Kawachi et al[15] in individual sampled by behavioral surveillance risk factors linked social capital to health outcomes. From the study they tried to link that socially isolated individuals are at increased risk for poor health outcomes because of their limited access to resources such as instrumental aid, information, and emotional support. The ecological level correlation between social capital and poor health could be explained by the fact that more socially isolated individuals reside in areas lacking in social capital.

The problem with understanding the relationship between health and its social determinants is that there are only few population based data set that routinely collect data on these factors in a comprehensive way over time. The field of social determinants of health is perhaps the most complex and challenging of all.

The relationship can be understood better if we draw literature from other disciples such as sociology, economics and political science and by looking at the qualitative studies which explain the insight about the disease but also health risk and protective factors.

Conclusion

Oral health per se is affected by exposure to a range of social conditions that are linked to socioeconomic position. These resources modify the exposure to conditions which are likely to influence people's response in ways that directly affect their oral health. Socioeconomic gradients in personal control, social support, stress and life satisfaction underlie patterns of dental behavior that in turn are associated with oral health. Hence a single question of SROH would help clinicians to understand the patients needs, evaluate his condition and plan out treatment which would be effective. SROH has a unique role in people's perceptions of their overall health yet is not fully captured by SRH. Therefore, it should be considered by general health care providers in their assessments of the health status of the patients.

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A Review of Oral Manifestations In Patients With Eating Disorders

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Abstract

Thousands of women and an increasing number of men look in the mirror everyday and hate what they see. When you look in the mirror, you are seeing what your eating disorder wants you to see; you are not seeing the true picture. Eating disorder presents a challenge to researchers and clinicians because of their own fatal consequences. An eating disorder is a complex compulsion to eat in a way which disturbs physical, mental, and psychological health. Eating disorder presents a challenge with various oral manifestations like tooth erosion, dentinal sensitivity, xerostomia, salivary gland enlargement, dental caries and traumatic ulceration of oral soft tissues. The treatment includes consultation with a psychiatrist for counseling and maintaining a good oral hygiene, use of desensitizing toothpaste, fluoride applications in active phase of treatment. Later esthetic treatment with porcelain laminated veneers, dentin-bonded crowns, composites, and complete-coverage restorations are required along with good nutrition and regular dental visits. **(Terna J Dent Sci 2012; 1: 28-31.)**

Key words: Purging, Binge Eating, Tooth Erosion.

Introduction

Eating disorders are a group of conditions characterized by abnormal eating habits that may involve either insufficient or excessive food intake to the detriment of an individual's physical and emotional health[1]. The causes of eating disorders are complex and poorly understood, though it is clear that they are often associated with social situations[1].

Most common eating disorders:

- Anorexia nervosa[1] characterized by refusal to maintain a healthy body weight and an obsessive fear of gaining weight.
- Bulimia nervosa[1] characterized by recurrent binge eating followed by compensatory behaviors such as purging (self-induced vomiting or excessive use of laxatives)
- Binge eating disorder, binge eating without compensatory behavior.
- Purging disorder characterized by recurrent purging to control weight or shape in the absence of binge eating episodes.

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.
This study has been self-supported by the authors.

- Pica[3] is defined as a compulsive craving for eating, chewing or licking non-food items or foods containing no nutrition. These can include such things as chalk, plaster, paint chips, baking soda, starch, glue, rust, ice, coffee grounds and cigarette ashes.

Causes:

1. Eating behavior is a complex process controlled by the neuro-endocrine system, dysregulation of the HPA axis has been associated with eating disorders, such as irregularities in the manufacture amount or transmission of certain neurotransmitters.
2. Immune system: Studies have shown that a majority of patients with anorexia and bulimia nervosa have elevated levels of autoantibodies that affect hormones and neuropeptides that regulate appetite control and the stress response. There may be a direct correlation between autoantibody levels and associated psychological traits.
3. Studies have shown that lesions to the right frontal lobe or temporal lobe can cause the pathological symptoms of an eating disorder.

a. Tumors in various regions of the brain have been implicated in the development of abnormal eating patterns.
b. Child abuse could precipitate eating disorders.
c. Social isolation of an individual.
d. Parental influence on the child.

Anorexia nervosa[2,3]:

Anorexia is characterized by significant weight loss resulting from excessive dieting[2]. Most women and an increasing number of men are motivated by the strong desire to be thin and a fear of becoming obese. Anorexics consider themselves to be fat, no matter what their actual weight is. In their attempts to become thinner, the anorexic will avoid food and taking in calories at all costs. Anorexics usually strive for perfection. They set very high standards for themselves and feel they always have to prove their competence. Anorexics usually have low self-esteem and sometimes feel they don't deserve to eat. The anorexics usually deny that anything is wrong. Hunger is strongly denied. Approximately 1 percent of adolescent girls develop anorexia nervosa, a dangerous condition in which they can literally starve themselves to death.
In patients with *anorexia*, starvation can damage vital organs such as the brain and heart. To protect itself, the body shifts into "slow gear": monthly menstrual periods stop, breathing pulse and blood pressure rates drop, and thyroid function slows. Nails and hair become brittle; the skin dries, yellows, and becomes covered with soft hair called lanugo. Excessive thirst and frequent urination may occur. Dehydration contributes to constipation, and reduced body fat leads to lowered body temperature and the inability to withstand cold.
Mild anemia, swollen joints, reduced muscle

mass, and light-headedness also commonly occur in anorexia. If the disorder becomes severe, patients may lose calcium from their bones, making them brittle and prone to fractures.

They may also experience irregular heart rhythms and heart failure. In some patients, the brain shrinks, causing personality changes. Fortunately, this condition can be reversed when normal weight is reestablished.

Bulimia nervosa[2,3,4]:

A destructive pattern of excessive overeating followed by vomiting or other "purging" behaviors to control their weight. 2-3 percent of young women develop bulimia nervosa. Bulimia is characterized by a cycle of binge eating followed by purging to try and rid the body of unwanted calories. A binge is different for all individuals. It could range from a cookie to intake of 10000 calories. Purging methods usually involve vomiting and laxative abuse. Other forms of purging can involve excessive exercise, fasting, use of diuretics, diet pills and enemas.

Bulimics are usually people who do not feel secure about their own self worth. They usually strive for the approval of others. They tend to do whatever they can to please others, while hiding their own feelings. Food becomes their only source of comfort. Bulimia also serves as a function for blocking or letting out feelings. Unlike anorexics, bulimics do realize they have a problem and are more likely to seek help.

In rare instances, binge eating causes the stomach to rupture; purging may result in heart failure due to loss of vital minerals such as potassium.

Vomiting causes other less deadly, but serious problems -- the acid in vomit wears down the outer layer of the teeth and can cause scarring on the backs of hands when fingers are pushed down the throat to induce vomiting. Further, the esophagus becomes inflamed. As in anorexia, bulimia may lead to irregular menstrual periods. Interest in sex may also diminish.

Binge eating disorder[2,3,4]:

Is characterized by consuming large quantities of food in a very short period of time until the individual is uncomfortably full. Binge eating disorder is much like bulimia except the individuals do not use any form of purging. Individuals usually feel out of control during a binge episode, followed by feelings of guilt and shame. Individuals can also use food as a way to numb themselves, to cope with daily life stressors, to provide comfort to them or fill a void they feel within. Like all eating disorders, binge eating is a serious problem but can be overcome through proper treatment.

People with binge eating disorder are usually overweight so they are prone to the serious medical problems associated with obesity such as high cholesterol, high blood pressure and diabetes. Obese individuals also have a higher risk for gall bladder disease, heart disease, and some types of cancer. Individuals with binge eating disorder also have high rates of co-occurring psychiatric illnesses especially depression.

These disorders have a high relapse rate which can affect the patient's dental health. Often the first manifestation of an eating disorder appears in the mouth. Often the first health care professional to detect an eating disorder is a dental professional.

Oral complications are[2,3,5]:

- Erosion of lingual tooth enamel
- Bad breath from constant purging
- Increase in dental caries
- Sore throat
- Oral sores with traumatic ulceration of the palate
- Irritation to the lips and other soft tissues
- Dentinal sensitivity
- Swelling or enlargement of the parotid salivary gland
- Swelling can also occur in the sublingual and submandibular glands
- Xerostomia

Erosion[2]:

Individuals with anorexia nervosa or bulimia nervosa may experience symptoms such as sensitive teeth on having hot, cold or sweet foods. These lesions appear as early as six months from the start of the problem. Tooth enamel erosion or perimylolysis is associated with the chronic regurgitation of gastric contents. Enamel erosion is defined as a condition of loss of enamel and dentin on the lingual surfaces of the teeth as a result of chemical and mechanical effects caused mainly by regurgitation of gastric contents and activated by movements of the tongue. The hydrochloric acid contained in vomitus breaks down the enamel and dentin of the teeth as it moves through the oral cavity.

The erosion associated with eating disorders typically has a smooth, glassy appearance particularly on the palatal surfaces of the maxillary anterior teeth. Teeth become translucent as acid destroys the inner portion, leaving a thin layer of enamel. These teeth will have smooth glassy appearances that are void of stains or lines. If the posterior teeth are affected there is often a loss of the occlusal surfaces of the teeth. The margins of restorations on posterior teeth may appear to be floating or higher than adjacent tooth structures. The acid wears away the enamel layer of the tooth, this leaves the pulp and nerve endings exposed. In extreme cases discoloration may occur. Other occlusal changes include anterior open bite and loss of vertical dimension caused by loss of occlusal and incisal tooth structure.

Some individuals demonstrate buccal erosion of the enamel surfaces of both the maxillary and mandibular anterior teeth. This finding has been attributed to excessive consumption of citrus fruit drinks as part of the diet of persons with eating disorders or as a result of medications prescribed by physicians for those with anorexia. Dextrose tablets and sucrose containing vitamin C beverages have been used in the treatment of individuals with anorexia.

Rampant decay:

Widespread cavities over a short period of time are a significant problem for anorexic/bulimic patients. The problem is two-fold: those patients who binge on high-calorie, high-carbohydrate foods and then purge run the greatest risk of decay. The sugar in the food set up an acid-attack on the enamel, while the act of purging bathes the teeth in hydrochloric acid from the stomach. This acid not only contributes to decay, but can also erode the teeth and fillings. The chronic bulimic patient will need numerous fillings over and over again, and have eroded enamel on the lingual aspect of teeth.

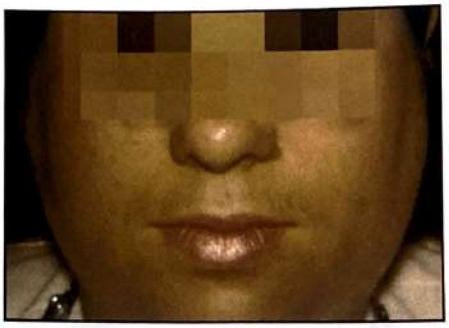
Salivary gland hypertrophy[4]:

The occurrence of enlargement is related to the duration and severity of vomiting. Enlargement of the parotid glands and occasionally the sublingual glands is a frequent oral manifestation of the binge-purge cycle of individuals with eating disorders. The enlargement may be unilateral or bilateral. The parotid swelling is soft to palpation and painless. The duct appears to be patent with a normal salivary flow and the absence of inflammation.

The occurrence and severity of parotid swelling is related to the frequency, duration, and severity of the binge-purge cycle. Frequent vomiting may cause a chronic work hypertrophy or an autonomic neuropathy that leads to enlarged acinar cells. The onset of swelling follows a binge-purge episode by two to six days. Initially, the enlargement may be intermittent, but eventually, it can persist. This results in a cosmetic deformity that may compel the

Orthodontic abnormality, anterior open bite and loss of vertical dimension

Erosion and margins of restorations are higher than adjacent tooth structure



Bilateral parotid gland enlargement

Erosion of the teeth on lingual and occlusal surfaces

individual to seek treatment because it affects his/her psychological state.

Dry mouth[4]:

Excessive vomiting results in exhaustion of salivary glands leading to dry mouth and thus saliva loses its acid neutralizing properties in the usual way. This makes teeth more vulnerable to acid attack and caries. The amount of saliva is affected by abuse of laxatives, diuretics, dehydration from fasting and vomiting. Reductions in salivary flow rates and xerostomia have been found in individuals who binge eat and induce vomiting or abuse laxatives and diuretics. xerostomia is also a common side effect of psychotherapy medications, particularly antidepressants, prescribed for the treatment of eating disorders.

Oral hygiene status:

Persons with eating disorders may exhibit poor oral hygiene resulting in increased gingival inflammation and gingival erythema. Poor oral hygiene is more common in individuals with anorexia than in those with bulimia. Generally, persons with anorexia are more prone to depression and manifest less interest in oral hygiene practices. Individuals with bulimia tend to be more concerned about their appearance and are more meticulous about their oral hygiene.

Those who binge eat and purge may demonstrate trauma to the oral mucous membranes and the pharynx[4].

Trauma to the oral mucous membranes and the pharynx[4].

The rapid ingestion of large amounts of food and the force of regurgitation have been implicated as the cause of trauma to the tissues. Objects used to induce vomiting such as fingers, combs, and pens can cause injury to the soft palate. Other changes in the oral tissues that may be noted include erythema, and angular cheilitis. Due to repeated vomiting, anorexic/bulimics may have severely swollen tonsils or soft palate. Some people may suffer from glossitis.

In anorexia, semi-starvation deprives the body of the nutrients it needs. Osteoporosis can develop, weakening the jaw bones and leading to tooth loss.

TMJ Problems:

Degenerative arthritis within the tempero-mandibular joint occur leading to pain in the joint area, headaches, and problems in chewing and opening/closing the mouth.

Pica:

Individuals with pica presenting with iron deficiency anemia may present with glossitis, xerostomia and dysphagia.

The first step in establishing a diagnosis and treatment plan is the initial assessment which involves[6]:

1. Review of patient's history.
2. Review of current symptoms presented.
3. Assessment of physical status.
4. Assessment of other psychiatric issues or disorders such as depression, anxiety, substance abuse, or personality issues.

Treatment plans often are tailored to individual needs and may include one or more of the following[7]:

- Individual, group, and/or family psychotherapy
- Medical care and monitoring
- Nutritional counseling
- Medications.

Psychological counseling needs to address both the eating disordered symptoms and the underlying psychological, interpersonal and cultural forces that contributed to the eating disorder. To reduce or eliminate binge-eating and purging behaviors, a patient may undergo nutritional counseling and psychotherapy, especially cognitive behavioral therapy (CBT), or medication. The therapist helps the patient learn how to identify distorted or unhelpful thinking patterns, recognize, and change inaccurate beliefs, relate to others in more positive ways, and change behaviors accordingly.

Cognitive-behavioral therapy, inter-personal psychotherapy, family therapy, and behavioral therapy have all shown promising results in treating eating disorder sufferers.

- Bulimia nervosa is more common than anorexia nervosa and has a better prognosis[8].
- The rate of mood, anxiety, and substance use disorders is higher in the families of bulimic than anorexic patients[8].
- Hospitalization is indicated when body weight drops below 75% of ideal body weight, in the presence of significant fluid and electrolyte imbalance, and when heart rate falls below 40 bpm or rises above 110 bpm when the patient stands[8].
- Antidepressant medication is more effective for bulimia nervosa than for anorexia nervosa[8].
- Anorexia nervosa and bulimia nervosa respond well to a combination of individual, family, and group psychotherapy inter-ventions that focus on the recovery of normal eating behavior[8].

A number of eating disorder-specific measures have been developed that aim to assess perceived quality of life while also minimizing response bias, which can be

attributable to the ego-synchronicity of the eating disorders. While these measures are of great importance, further work is still required to assess the reliability and validity of these scales and to adapt the current available measures to increase their suitability for incorporation into clinical and research protocols[9].

Dental Treatment Protocol[3,4,5]:

- Start with a rigorous hygiene and home care.
- Regular professional oral prophylaxis.
- In-office fluoride applications to prevent further erosion and decrease dentin sensitivity.
- Daily home application of fluoride in custom trays to promote remineralization of the enamel.
- Use of artificial saliva.
- Chewing sugar free chewing gum after meals can help to stimulate saliva production and counter some of the effects of a dry mouth.
- Immediately after vomiting, rinse the mouth with sodium bicarbonate or magnesium hydroxide (place one teaspoon in half a glass of water) and rinse, or use a proprietary preparation. and then waiting several hours before drinking or eating anything acidic, such as fruit or fizzy drinks, or before brushing the teeth. This treatment enables the saliva to have a neutralizing effect on the stomach acid which seeps into the surface enamel after vomiting.
- Use a fluoride rinse to neutralize acids and protect and remineralize the tooth surfaces or using an inexpensive mouthwash containing fluoride is another alternative.
- Brushing the teeth after vomiting will lead to excessive enamel erosion.
- After brushing, stannous fluoride gel application, or rinsing with neutral sodium fluoride is recommended.
- Floss daily.
- Commitment to professional treatment.
- Use of desensitizing toothpaste will help decrease dentinal sensitivity.
- Esthetic treatment should not be done during the active phase of the disorder.
- The first and foremost important factor is the physiologic rest position for the patient. Establishing a new vertical dimension will dictate the outcome for proper phonetics and proportions for an aesthetic result. Teeth to be restored with porcelain-laminated veneers, dentin-bonded crowns with minimal tooth preparation, composites, and complete -coverage restorations.
- 1200 – 1500 mg of calcium, per day is recommended in addition to eating a healthy variety of all foods.
- Frequent dental visits are advised to monitor oral condition.

Conclusion:

A good clinical evaluation, patient approach, referral, and oral treatment takes a multidisciplinary approach to address eating disorders. Dentists and dental hygienists could potentially play a fundamental role in the secondary prevention of eating disorders. They are often the first health professionals to observe the overt health effects of eating disorders and, therefore, may be the first health care provider in the process of problem identification and referral.

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Interesting Endodontic Cases

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Abstract

Deviation from normal root canal anatomy is often encountered in day-to-day endodontic practice. This paper emphasises the fact that one should be aware of such variations. In accordance with a number of studies pertaining to varitations in root canal anatomy the presented cases showed presence of a second mesiobuccal canal in two cases of maxillary molars and 3 canals in a mandibular 1st Premolar. Pre-operative assessment of every case through clinical findings and well-angulated radiographic examination should be the norm rather than exception for successful endodontic treatment.. **(Terna J Dent Sci 2012; 1: 32-34.)**

Key words: - Missed canals, 2nd Mesiobuccal canal, Unusual canal anatomy.

Introduction

Complexities in the root canal system always warrant the clinician to be observant towards any deviances from the routine. Many situations come to pass where the clinician needs to modify his perspective and approach for treating such a case. Careful radiographic observation, access cavity modifications, higher magnification, illumination and the use of ultrasonics with good clinical skills may be required at different stages in treatment to tackle such cases.

These case reports showcase varied clinical situations from tackling of a MB2(Second Mesiobuccal canal) in an upper molar to a three canalled lower premolar and a retreatment involving a missed root canal all picked up in the departments routine out-patients.

An attempt has been made to present a diversity of such cases wherein all the above mentioned techniques had to be utilized without drifting from sound endodontic fundamentals and techniques.

Case 1: Unusual Three- canalled mandibular second premolar (Case courtesy Dr. Roheet Khatavkar)

A 33 year old female reported to the Department of Conservative Dentistry and Endodontics, Terna Dental College with a complaint of throbbing intermittent pain in the lower right posterior region since 2 days.

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

This study has been self-supported by the authors.

Clinical examination revealed deep disto-occlusal caries and an old mesio-occlusal composite restoration in tooth no. 45 lower right 2nd premolar. The tooth was tender to percussion. The intraoral periapical radiograph showed a large radiolucency involving the distoocclusal surface and approaching the pulp in tooth no 45. Additionally there was a radiopacity on the mesial aspect indicative of a restoration (fig 1A). A diagnosis of acute irreversible pulpitis with acute apical periodontitis secondary to deep disto-occlusal caries was made and root canal treatment was advised.

A pterygomandibular nerve block was administered and the tooth was isolated under rubber dam. By means of a high speed air rotor drill and sharp spoon excavators caries was excavated. The lost distal marginal ridge was restored provisionally by Glass Ionomer cement (D-Tech) restoration. Root canal access opening was now done using high speed air rotor drill with diamond burs. Canals were explored under magnification with a surgical endodontic microscope (Seiler, USA) and using ultrasonic tips (EMS)[1]. Three canals were located and negotiated to the apex with no. 10 K files using EDTA (RC Prep, Prime dental, India) as a lubricant[2]. Notably two canals were found bucally and the third canal lingually (fig 1B).

A working length radiograph was made with the long cone paralleling technique (fig 1C). All the canals were prepared with rotary protapers [Dentsply, Switzerland] using 5% sodium hypochlorite as an irrigant[3,4]. On completion of cleaning and shaping a master cone radiograph was made to verify the tooth length (fig 1D). The canals were dried using sterile paper points & were coated with AH plus [Dentsply, Switzerland] root canal sealer .Obturation was done using lateral compaction technique (fig 1E & 1F) with F1 size Protaper Guttapercha points [Dentsply, Switzerland] and accessory Gutta percha points.. The access cavity coronal seal was obtained with composite restoration [Tetric Ceram- Vivadent]. Thereafter the tooth was taken up for a full coverage crown.[5]

Case 2: Non- surgical re-treatment of an endodontically treated failing mandibular first molar- Missed canal (Case courtesy Dr. Chandrabhan Verma)

A 27 year old male patient was referred to the Department of Conservative Dentistry and Endodontics, Terna Dental College for a full coverage crown on tooth no. 36, lower left first Molar. The patient gave history of previous endodontic treatment with the tooth in question and did not have any discomfort with that tooth. Clinical examination revealed a temporary zinc oxide eugenol cement filling. A radiograph was taken to establish the presence and quality of endodontic treatment. Radiopaque root canal filling was seen in both the mesial and distal root. Close observation of the radiograph revealed a radiolucent line passing vertically through the mesial root indicative of a missed canal in the mesial root. Additionally, diffuse periapical radio-lucency was seen surrounding the mesial root supporting the possibility of a missed canal (fig 2A). It was decided to re-establish the access cavity and explore the possibility of a missed canal[6]. The patient was briefed regarding the course of treatment and the procedure was commenced.

A pterygomandibular nerve block was

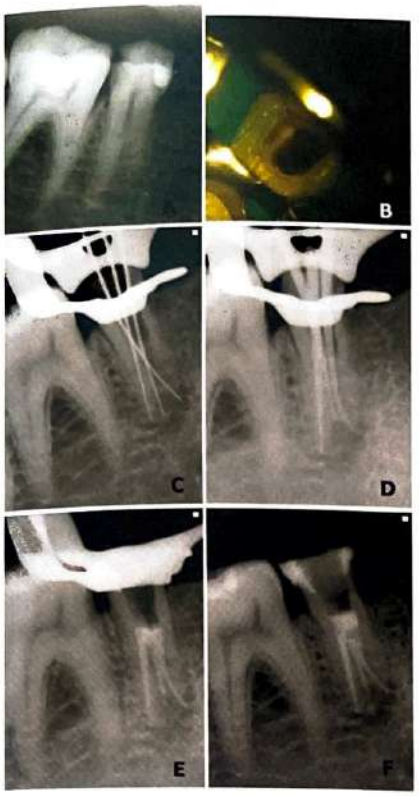

Fig 1: Three canalled mandibular second premolar. (Case courtesy Dr. Roheet Khatavkar)

Fig 2: Missed canal case:

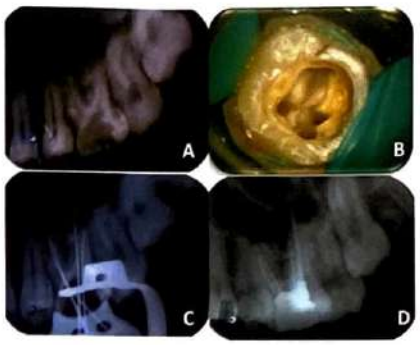

Fig 3: Second mesio-buccal canal in a maxillary first molar.

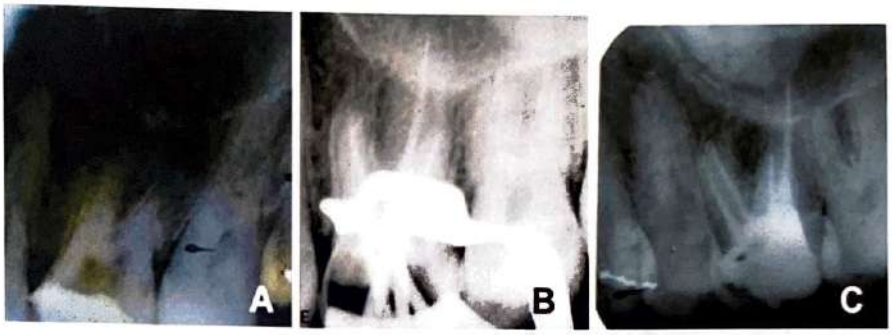

Fig 4: Second mesio-buccal canal in a maxillary first molar. (Case courtesy Dr. Mamta Tiwari)

given, rubber dam placed and the access cavity was re-established. Examination of the floor under magnification revealed a missed mesio-buccal canal[7].The canal was negotiated with a no. 10 K file and a working length radiograph was made (fig2B). The canal was prepared with stainless steel hand files using the hybrid step back step down technique with 5% sodium hypochlorite and EDTA being used for irrigation with a 27 gauge needle. A master cone radiograph was taken (fig 2C). The canal was dried with sterile paper points, coated with zinc oxide eugenol sealer and obturated with lateral compaction technique (fig 2D).The coronal seal was obtained with silver amalgam by preparing a Nayyar core[8]. Post endodontic restoration was followed up by a full coverage crown.

Case 3: Second mesiobuccal/ MB2 canal in a maxillary first molar (Case courtesy Dr. Madhuri Kune)

A 22 year old female was referred to the Dept. of Conservative dentistry and Endodontics, Terna Dental College. The patient complained of mild continuous pain in tooth no. 16 (upper right first molar) which was localized in nature since 2 months. Clinical examination revealed a large mesio-occlusal cavitiy with clinically exposed pulp chamber. The tooth demonstrated mild tenderness to percussion. Radiographic exam showed a large mesio-occlusal radiolucency on the crown, approaching the pulp. Periodontal ligament space widening was noticeable at the apex of mesio-buccal root (fig 3A). A diagnosis of chronic irreversible pulpitis with apical periodontitis secondary to deep mesio-occlusal caries was made and root canal treatment followed by full coverage crown was advised with tooth no. 16.

Infiltration anesthesia was administered and the tooth was isolated under rubber dam. Caries excavation was accomplished using an air rotor drill and sharp excavators, following which the access cavity was established. Careful observation and probing of the floor of pulp chamber revealed the presence of 4 canals viz. mesio-buccal canal, a second mesio-buccal canal (MB2) just palatal to mesio-buccal canal, a disto-buccal canal and a palatal canal. All the four canals were negotiated upto the apex with no. 10K files lubricated with EDTA (RC Help, Prime Dental Products, India). A working length radiograph was made (fig 3C). After adjusting the final working length the canals were cleaned and shaped with stainless steel hand files using the step back technique[9]. The canals were dried and a closed dressing of calcium hydroxide was given with zinc oxide eugenol as the temporary seal.

At the subsequent appointment the filling was removed and canals were irrigated with 5% sodium hypochlorite. A mastercone radiograph was taken to ascertain length of the root canal filling. Canals were dried with sterile paper points. A clinical photograph was taken at this stage under magnification (5X) with a dental operating microscope (Seiler, USA) for demonstration of the location of canals (fig 3B). Zinc oxide eugenol sealer was applied with a lentulo spiral and obturation was done with lateral compaction technique. The post obturation radiograph demonstrates the root canal filled MB2 along with the other three canals, viz. mesiobuccal, distobuccal and palatal (fig 3D). The access cavity was filled with silver amalgam filling making a Nayyar core and the tooth was taken up for a full coverage crown.

Case 4: MB2 Canal in Maxillary Molar tooth (Case courtesy Dr. Mamta Tiwari)

A 30 year old male patient reported to the Dept. of Conservative Dentistry and Endodontics, Terna Dental College with a chief complaint of pain in the upper left posterior quadrant. He described the pain as low intensity, continuous pain since the past 3 months. Notably, the patient gave a history of previous dental treatment with tooth no. 26 (Upper left first molar tooth).

Clinical examination showed the presence

of a temporary cement filling. The tooth was sensitive to percussion. Radiographic examination showed evidence of an incomplete root canal treatment done in tooth 26. Root canal treatment followed by a full coverage crown was advised. Infiltration local anesthesia was administered and the tooth was isolated under rubber dam. The temporary filling was removed and access cavity was re-established. Examination of the floor of pulp chamber revealed the presence of a second mesio-buccal canal (MB2) in addition to a mesio-buccal canal, a disto-buccal canal and a palatal canal[10]. Patency was established in all the four canals using a no. 10 ISO K-file. A radiograph for working length determination was taken. The canals were prepared by step back technique with ISO stainless steel files using 5% sodium hypochlorite as an irrigant and EDTA. Master cone radiograph was taken to verify the working length (fig 4B). The canals were dried with sterile paper points and zinc oxide eugenol sealer was coated on the canal walls with the paper point. Obturation was done using lateral compaction technique. The post obturation radiograph shows densely compacted gutta-percha in MB2 which can be appreciated as a separate canal exiting the apex of the mesio-buccal root (fig 4C). Silver amalgam was filled to restore the access cavity by preparing a Nayyar core and followed up by a full coverage crown.

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Benefits of the Dental Operating Microscope

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Abstract

Magnification helps the user to see not only more, but to see better. High levels of magnification increase the aggregate amount of visual information available to dentists for diagnosing and treating dental pathology, which may allow dentists to develop ways of solving a given dental problem that differ from those used by dentists who use unaided vision. By now many dentists have adopted the use of microscope and more dental schools are now requiring that students use them. Despite their higher price tags, however, when the dental operating microscope is fully integrated into a practice and used to its fullest potential, a return on investment is improved ergonomics. **(Terna J Dent Sci 2012; 1: 35-39.)**

Key words: DOM (Dental Operating Microscope), Magnification

Introduction

As changes related to most of the dental problems arise at microscopic level like caries or periodontal problems, by using the microscope, these can be detected at early stage. Also by using microscope, quality and precision of dental procedures can be improved. Besides these there are several advantages of using microscope like increased visualization, improved ergonomics, proper documentation.[1,2,3] (Fig.1).

Advantages of Dental Operating Microscopes

1. Increased Visualization

Carr reported that the human eye, when unaided by magnification, has the inherent ability to resolve or distinguish two separate lines or entities that are at least 200 microns, or 0.2 mm, apart. In addition to having up to six levels of magnification ranging from 2x to 20x available, illumination is a critical component in increasing visualization. Most microscopes are equipped with an integrated coaxial light source that allows for unobstructed, shadow-free illumination of the operating field (Fig 4,5,6). With coaxial illumination, the path of light is directed parallel to the microscope's optical axis, which allows for significantly improved visualization of even the most difficult to access areas of the oral cavity[7,8]

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

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2.Digital Documentation Capabilities

With the optional addition of a beam-splitting device, one is able to integrate various types of digital recording devices, such as an SLR and/or video camera. Digital documentation capabilities enable the clinician to efficiently capture and share with patients what is seen during an examination pre-operatively, intra-operatively, and postoperatively (Fig.2).

Images captured during an examination, for instance, are an excellent communi-cation and education tool in helping patients to better understand their diagnostic findings and why certain treatments may be necessary, especially for problems or conditions that produce no obvious symptoms to the patient. This can lead to greater rates of case acceptance, and significantly streamline the amount of time required in gaining it.

During treatment, images can be efficiently captured, shared, and stored in the patient's chart. This is especially useful when unforeseen problems are encountered. This not only helps to increase a patient's level of trust and confidence in the treating doctor (especially with newer patients), but can also aid in reducing one's medical-legal risk[8,9,10,11,12]

3. Improved Ergonomics

With dental microscopy, improved ergonomics is realized on many levels, the most obvious being improved posture. While using the microscope, the clinician is able to practice while looking straight ahead without having to either bend forward in an effort to see better (causing lower-back pain), or raise the patient horizontally in order to bring the oral cavity closer to the clinician (causing neck pain). The microscope allows for 100 percent of the retina to be focused on the site.

By operating in a more upright, neutral and balanced posture, the operator is less likely to experience strain or fatigue of neck and back muscles and is, therefore, able to work comfortably for extended periods of time. This can enable the practitioner to provide more dentistry in fewer visits, increasing the clinician's productivity and making for very happy patients. Ergonomics is also improved during digital documentation because intraoperative images can be captured very efficiently by the assistant so that the clinician does not have to stop treatment. Finally, microscopes with a long working distance allow dentists to maintain a longer distance from the patient during dental work reducing the risk of exposure to aerosols and spatter[13,14,15].

3. Improved precision of treatments

a. Examination, diagnosis, and treatment planning

High-powered magnification allows dentists to identify a microscopic blemish, colour alteration, tiny amounts of plaque collecting within the grooves, microscopic amounts of chalky white demineralization around the grooves, and tiny amounts of flaking of darkened carious tooth structure within the crevices of these grooves.

Intraoral prosthetic devices have minimal tolerance of fit and microscopic

Fig. 1 Dental Operating Microscopes

Fig.2 Microscope attached with digital camera on the right side, ring flash at the bottom and digital medical grade cube camera on the left side for Documentation, (Image courtesy of Dr. Glenn A. van)

Fig.3 Operator sitting comfortably at his microscope.
(Image courtesy of Dr. Glen van As)

interferences may prevent crowns, bridges, and removable partial denture frameworks from seating fully. These interferences may be located on the metal under structure of fixed or removable prostheses.

With enhanced visualization, the clinician's ability to diagnose problems in the earlier stages of a disease process is possible. Treatments also can be performed with a greater level of precision, thereby reducing the occurrence of failures and the need for redos[15,16,17].

b. Operative dentistry

While cavity preparation high magnification shows the color contrasts between carious and healthy tooth structure on a microscopic scale (Fig.4).

It also enhances dentists' ability to see gaps between restorative material and preparation margins. High magnification allows for precise detection and adjustment of the interproximal curvatures of Class II restorations[17,18].

a. Fixed prosthodontics

Under high magnification, undercuts in crown and bridge preparations, rough and pitted areas on preparation walls and ski slopes that may be difficult to see with unaided vision are more obvious[19,20] (Fig.5).

b. Removable prosthodontics

Magnification helps in detecting border overextensions or interference in custom trays or finished dentures, redness or hyperkeratosis in edentulous ridges[1].

c. Paediatric dentistry

As primary teeth have an intrinsically small volume of tooth structure, magnification facilitates the conservation of primary tooth structure when performing restorative or pulpotomy procedures[1].

d. Periodontics

High magnification aids in detecting tiny spicules of calculus more easily and distinguish between the colour of calculus and the colour of the tooth surface.

Magnification also improves a dentist's ability to perceive fine details in periodontal surgery and allows for more precise suturing of periodontal flaps[21,22,23].

e. Oral surgery

High magnification helps in locating purchase points, for surgical extractions, magnification enables dentists to distinguish more efficiently between tooth structure and the surrounding bone.

High magnification improves a dentist's ability to see the different colors or surface textures of an intraoral lesion and the borders between an intraoral lesion and normal tissue more precisely, which facilitates complete removal of the lesion when performing an excisional biopsy.

f. Endodontics

Traditional endodontics has been based on feel, not sight. Together with radiographs and electronic apex locators this blind approach has produced surprising success. There is, however, a significant failure rate, especially long-term failure. Today, a small but growing number of clinicians are providing endodontic and endorestorative treatments based on direct microscopic visualization of the pulp chamber and coronal portions of canal systems. This huge shift in clinical accuracy is bringing a revolution to the field of endodontics with greater success rate.

Magnification allows dentists to better identify anatomical landmarks within the pulp chamber—including the sides, overhanging walls that are remnants of the pulp chamber roof, and initial perforations into the pulp—and to differentiate between the pulp horns and the main body of pulp within the chamber. Magni-fication aids in locating the mesiobuccal-2 canal and other accessory canals of maxillary molars, removal of broken instruments, repair of perforations, etc. (Fig. 6,7).

During instrumentation, the improved ability to see specific canals allows dentists to maneuver files into canal openings with greater efficiency, to distinguish between vital and necrotic canals, and to detect tiny amounts of purulence or blood draining through specific canals. Dentists sometimes can directly see tiny amounts of necrotic pulp material that were not removed during canal instrumentation. As a result, it is possible for a dentist to determine if all canals are accessed and instrumented when a direct view might be difficult or when the dentist would have to remove excessive amounts of coronal tooth structure to acquire such direct vision[24-29].

Operating dental microscopes are essential for the removal of fractured instruments. The enhanced vision with magnification and illumination from a microscope allows clinicians to observe the most coronal aspects of broken instruments and to remove them without any perforations[30].

g. Surgical endodontics

Surgical endodontics and the success rate for apicoectomies were also shown to improve with routine usage of the operating dental microscope. It was found by Shanelec, Belcher and others that routine usage of the DOM could provide for more delicate surgical procedures, requiring microsurgical armamentarium, including smaller blades and 7–0 to 10–0 sutures. These delicate surgical procedures allowed for reduction in postoperative pain and quicker healing[31,32].

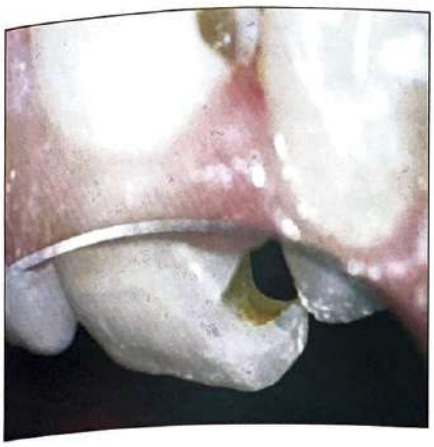

Fig.4 High magnification reveals caries of the underside of the superior wall of a class III restoration, which is difficult to see with unaided vision. (Image courtesy of Dr. Donato Napoletano)

Fig.5 An all-porcelain crown preparation is examined under a microscope to assess if its butt margin is smooth and its walls are free of undercuts. This viewing perspective is parallel to an acceptable path of draw. (Image courtesy of Dr. Donato Napoletano)

Fig.6. A microscopic view of this molar provides diagnostic information that would be unavailable when viewing the tooth with unaided vision, such as extent of crack propagation (close to the furcation), the number of pin retention holes placed into the molar by the previous dentist, and views of the MB2 canal and other root canal orifices. (Image courtesy of Dr. Glen van As)

h. Diagnosis of cracked teeth

High magnification is essential for seeing cracks or craze lines that are difficult to see with unaided eyes.

Magnification allows dentists to see more precisely which aspect of a tooth is occluding into a point on an opposing tooth where there are signs of occlusal damage. These signs could include cracks in teeth or restorations, craze lines (cracks in enamel but not necessarily dentin), wear facets, cracks at slightly elevated marginal ridges, or areas where the enamel has been worn by opposing porcelain, exposing dentin and thus causing sensitivity[33] (Fig. 6,8,9).

Integrating Dental Operating Microscopes

Not allowing for sufficient time is perhaps the major reason why many technologies never get integrated fully and used to their fullest extent and potential. It is important to realize that when incorporating anything new to one's practice that problems will arise along the way. To minimize the occurrence and frequency of potential problems and ensure that the integration process proceeds smoothly, an implementation plan is critical. Formal hands-on training will significantly decrease the amount of time required to attain complete, successful integration. Also the staff training and motivation plan should be deployed long before the technology even arrives or is installed in the office This will keep staff members interested and motivated during the integration process.

One should preferably start out using the lowest to low-medium powers of magnification before advancing to higher powers of magnification to allow sufficient time for one's hand-eye coordination to adapt to operating under a magnified field. Once a point is reached where one feels comfortable in working under various levels of magnification in the facial anterior segments of the oral cavity, he or she can then proceed to crown or veneer preparations on the maxillary anterior segments where the use of a mirror would be necessary. As the use of the mirror becomes integrated with the use of a microscope in the anterior maxillary region, one can then advance posteriorly on the maxillary arch only, until an adequate level of proficiency is reached. The posterior mandibular region is generally considered to be the most difficult area of the mouth for an inexperienced microscope user to operate in and should, therefore, be avoided during the very early stages of the integration process.

Dentists using magnification must possess a concept of measurement when viewing objects at the magnified level. Dentists should remember some measurement values when working under magnification. For example, the cutting end of a 330 bur has a length of 1.5 mm and a width of 0.5 mm, while a 557 bur has a length of 3 mm and a width of 0.75 mm. Dentists also may use a periodontal probe during a procedure as a measuring device[34-37].

Summary

To a non-user, the most obvious disadvantages of microscopes may appear to be the cost and amount of time needed to fully integrate them but the obstacles are not as high as many would think. By helping patients literally see the importance of treating things sooner than later (or many times not at all), and by providing treatment with greater efficiency and precision, it is easy to see how the microscope can be an excellent return on investment. The use of the operating microscope in dentistry provides tremendous benefits for any clinician. The advantages of improved precision and ergonomics ease of documentation and the ability to communicate with patients, staff, and colleagues are clear. As the new millennium dawned, dentists using the D.O.M. have found that the technology not only improves treatment outcomes, but also increases the enjoyment of providing the treatment.

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Fig. 7. A- Broken instrument in the canal of single rooted tooth B- Broken instrument in mesiolingual root canal of mandibular molar tooth.

Fig.8 High magnification reveals multiple craze lines and distal marginal ridge cracks on a premolar. (Image courtesy of Dr. Glen van As)

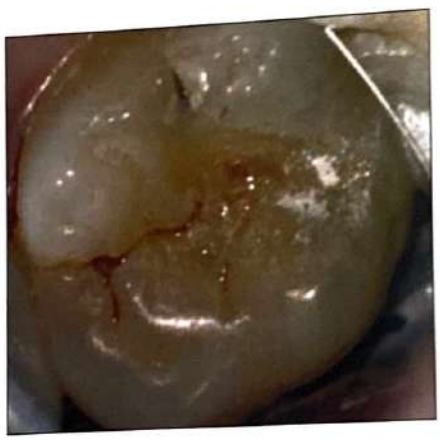

Fig. 9 High magnification reveals bleeding through mesiodistal crack in a molar, suggesting that the crack has gone into the pulp of the tooth, requiring endodontic therapy. (Image courtesy of Dr. Donato Napoletano)

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Terna Journal of
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Walking Bleach : A Simple Cost Effective Tooth Whitening Technique

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Abstract

In present times, several teeth whitening (bleaching) techniques are in use for vital and non-vital teeth. Among them are walking bleach, home bleach, chair side or In-office bleach using plasma arc, LED light and lasers. Discussed below is the simple yet effective technique of walking bleach using a mix of sodium perborate and 35% hydrogen peroxide.

(Terna J Dent Sci 2012; 1: 40-41.)

Key words: tooth whitening, Non-vital bleaching (walking bleach), sodium perborate and hydrogen peroxide.

Introduction

With the media coverage and increased literacy levels in India, Cosmetic dentistry and esthetic awareness has reached a new level with every Indian wanting to improve his or her smile. Well, the patients want to avail of the benefits of simple esthetic procedures as bleaching but are not able to afford the treatments. An attempt has been made to put forward a cost effective and user friendly bleaching technique for non-vital tooth whitening which can be offered to patients from all economic strata and can be performed as a routine out patient procedure in clinics.

Material And Methods

A freshly prepared mix of sodium perborate (New modern chemical corporation, India) and 35% hydrogen peroxide, size 2 round bur, Glass Ionomer Type II restorative material and zinc oxide eugenol temporary cement was used for the following procedure.

Case Presentation

A 27 year old male patient came to the Department of Conservative dentistry and Endodontics, Terna Dental College, Nerul with a chief complaint of discoloured maxillary right central incisor [Tooth No. 11- FDI Tooth numbering](Figure I). A detailed case history was taken. Patient gave history of trauma to anterior teeth ten years ago and pain which disappeared on its own. The patient found his tooth discoloured with time and had undergone root canal treatment for the same. After radiographic investigation a periapical radiolucency in relation to the tooth 11 was seen (Figure II).

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

This study has been self-supported by the authors.

Treatment Plan

Step I: Removal of 2mm of gutta-percha from the canal below the cementoenamel junction

Step II: Placement of 2mm thick type II Glass Ionomer cement as a cervical protective barrier

Step III: Sealing of bleaching agent in the access cavity

Step IV: Recall and reassessment of bleaching progress. Repeat treatment procedure if necessary.

Initial shade assessment was done with Vitapan shade guide. Patient was explained in detail about the treatment procedure and its outcome and his consent was taken. Access was regained and coronal Gutta-percha was removed till the cementoenamel junction by using no. 2 round bur (Figure III) and a barrier of glass-ionomer cement (d-Tech, Japan) was created at cervical level.[1] At the same appointment one portion of sodium perborate (New modern chemical corporation, India) was mixed with 1ml of 35% hydrogen peroxide on a clean glass slab with a cement spatula.[2,3,4] Then the mix was placed in the access cavity and it was sealed using zinc oxide eugenol cement.[5] Patient was recalled after 48 hours for evaluation (Figure IV). On subsequent visit, a noticeable change of shade was observed. The whole mix was removed and above bleaching procedure was repeated for the next three visits with the gap of 48 hours. On every subsequent visit the tooth showed remarkable improvement in its appearance (shade). The above procedure was terminated when the shade blended with the adjacent tooth (Figure V).

The access cavity was sealed with composite resin restoration three weeks after completion of bleaching procedure.[6]

Discussion and Conclusion

As the name of treatment procedure suggests, patient can walk out of the clinic at the same appointment with satisfying results and without an economical burden. Thus it can be seen from the above technique that despite availability of

cutting edge techniques and expensive equipments, tooth whitening can be achieved by using inexpensive yet effective materials leading to optimum esthetic results for the masses of our country belonging to the all strata of the society.

Thus sparkling teeth with a beautiful smile will no longer be a dream but a reality.

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Pre-operative Photograph (Figure I)

Figure II

Figure III

Pre-operative Radiographs. Fig.III Radiograph showing GP retrieval till CEJ

Inter-appointment Photograph (Figure IV)

Post-operative Photograph (Figure V)

Pre-operative Photograph (Figure VI)

Post-operative Photograph (Figure VII)

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Rehabilitation of Anterior Esthetic Zone Using IPS e.max All-Ceramic System - A clinical Report

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Abstract

Rehabilitation in the anterior esthetic zone has always posed a challenge to the "ABLE" practitioner. The evolution of newer all-ceramic systems provides a choice of core/framework porcelains as well as allows the same material to be used as a veneer making it possible to select the appropriate material in terms of function and esthetics. Silicate ceramics allow porcelain laminate/veneers and crowns in the anterior region providing excellent esthetics while for posterior area where function takes precedence Zirconium-oxide ceramics are preferred. The IPS e.max ceramic system, heir apparent to the IPS Empress -2 system combines the advantages of Zirconium-Oxide ceramics (IPS e.max ZirCad) with excellent esthetic qualities of silicate ceramics (IPS e.max Press). This paper presents a clinical case report which involved the esthetic rehabilitation in the anterior esthetic zone with the IPS e.max ceramic system. The esthetic advantages of this all-ceramic over ceramo-metal restoration in terms of translucency, strength and ability to bond with the tooth structure are discussed. **(Terna J Dent Sci 2012; 1: 42-44.)**

Keywords: All ceramics, IPS-emax restorations, esthetics, ceramic rehabilitation.

Introduction

The selection of an all ceramic material depends on the requirement of the tooth being restored and also the clinical decision-making of "esthetic but weaker" versus "stronger but more opaque" restorations[1]. In general, the reasons to use an all ceramic complete coverage crown for an anterior tooth include replacement of an existing ceramometal crown, in case where the tooth structurally requires that the lingual surface be prepared or in cases where the occlusion requires a significant change[1] . In general, the decision will be based on the need for high strength (owing to the lack of an anterior guidance or the presence of parafunctional habits), amount of tooth reduction required, the laboratory preference and whether the clinician wishes to cement or adhesively bond the restoration[1]. A clinical case report which involves rehabilitation of the maxillary anterior esthetic zone with IPS emax ceramic system has been discussed below:

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.
This study has been self-supported by the authors.

Clinical Report:

Clinical H/O

A 36 year old female patient with no relevant medical history reported to Terna dental college with concern regarding the ceramo-metal restorations that was placed in the maxillary anterior quadrant for replacement of missing maxillary left and right lateral incisors(12,22). Past dental history revealed that the patient had expressed serious esthetic concerns during the insertion appointment itself of the fixed prosthesis approximately a year back.

Intraoral examination

Clinical examination revealed a ceramo-metal three-unit fixed prosthesis on either side of the midline replacing 12,22. The restorations appeared opaque white and lacked the translucency which was present in her natural teeth. The emergency profile was also labially proclined affecting her lip competency.

Radiographic Examination

OPG and IOPA revealed that 12,22 were missing and no endodontic treatment had been carried out in the abutment teeth 13,11,21,23.

Diagnosis and treatment plan:

Having understood the desires of the patient and studied the clinical status, the patient was informed that the only way to address the esthetic concern would be to replace the existing ceramo-metal restorations with "all-ceramic" restorations for which she was already

Fig 1: Pre-operative extra-oral view showing previous ceramometal restorations replacing missing 12,22.

Fig 2: Pre-operative intra-oral view showing previous ceramometal restorations replacing missing 12,22.

Fig 3: Post- operative extra-oral view showing IPS e-max restorations replacing missing 12,22.

Fig 4: Post- operative intra-oral view showing IPS e-max restorations replacing missing 12,22.

Fig 5 : Rehabilitated pleasing esthetically natural smile of the patient.

willing. For improving the emergency profile, intentional endodontic treatment of the abutment teeth 13,11,21,23 was mandatory in view of a favorable occlusion. "IPS e.max" system was selected for replacement of anterior esthetic zone which would provide the desired esthetics.

Treatment

Prior to removal of existing restorations, maxillary and mandibular irreversible hydrocolloid impressions were made for study models. The patient was anesthetized with 2% lignocaine (with 1:100,000 adrenaline). A flat ended cylindrical diamond was used to section the restoration buccally and lingually after which it was removed with a crown spreader. The abutment teeth 13,11,21,23 were then endodontically treated. In the successive visits, appropriate crown preparation with a shoulder finish lines was carried out bearing in mind the labial emergence profile. Prior to the impression procedure, careful gingival retraction was carried out using ultradent size 00 retraction cord. Then the maxillary arch impression was made using polyvinyl siloxane material(GC-Exaflex). The opposing arch impression was made in alginate, an irreversible hydrocolloid material (Tropicalgin). An interocclusal record was made between maxillary anterior crown preparations and mandibular anterior teeth with vinyl polysiloxane occlusal registration material. (Exabite, GC-America). Provisional restorations were fabricated with Protemp shade A2 using a vinyl polysiloxane matrix made from duplicated diagnostic wax-up. Well detailed provisionals were made and were well contoured in order to check the emergence profile and then cemented with non-eugenol cement (Nogenol). The final anterior restorations consisting of two separate three-unit prostheses (13-12-11, 21-22-23)using silicate ceramics IPS e.max Press for the core and IPS e.max Ceram for the ceramic veneer were fabricated. The prostheses were tried and evaluated for esthetics, phonetics and emergence profile. A mutually protected occlusal scheme was followed for the patient. Bearing in mind patient's satisfaction with the resultant esthetics, the prostheses were cemented with a dual-cured resin cement (Vario-Link). The excess cement was removed and patient was instructed for maintaining good oral hygiene protocol. The patient has been recalled every 3 months for routine evaluation and oral health care maintenance.

Discussion

The anterior esthetic zone indeed poses a challenge for successful rehabilitation. With the introduction of newer all ceramics, a choice of both framework veneer as well as core porcelains can be made effectively to provide satisfying results[2,3]. The reason to choose an all-ceramic system (IPS e.max) in the replacement of an existing ceramo-metal restoration was the ability to bond with the tooth structure as well as its excellent translucency and excellent esthetic potential[2]. As the abutment teeth had acceptable colored dentin, it enabled us to reduce less tooth structure and create esthetic equigingival margins and achieve predictable bond to the restoration itself as

IPS e.max can be etched easily. The outcome of the treatment met the patient's expectations of a pleasing natural smile

Summary

A case of rehabilitation of the anterior esthetic zone has been discussed in the clinical situation to meet the patient's expectations. The choice of all-ceramic (IPS e.max) restorations over ceramo-metal restorations is justified owing to the highly superior esthetics and translucent qualities and bonding to the tooth structure[2]. It is clear that the requirement for optical properties; tooth reduction, strength, occlusion, region of replacement (anterior or posterior), method of placement (bonded v/s cemented) vary for different clinical situations and thus dictate the choice of all-Ceramic system[1,2]. An appropriate choice would definitely lead to satisfying and predictable esthetic results. It is truly said that creating beauty is not a matter of "Soul Searching" but primarily interpreting form in its "NATURAL LIFE LIKE" manner.

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Management of Complicated Crown Root Fracture In Primary Dentition – A Case Report

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Abstract
Occurrence of traumatic injuries is common in day to day practice. To efficiently diagnose and treat a child patient with traumatic injuries to teeth involves management of not only the patient but also panicked parents. Over the years, primary teeth with complicated crown root fracture were preferred to be extracted instead of salvaging due to extensiveness of involved fracture. Follow up of three months with a salvaged primary tooth with complicated crown root fracture in this case report appears to give us a new treatment modality to manage such cases. **(Terna J Dent Sci 2012; 1: 45-47.)**

Keywords: Traumatic injury, complicated crown root fracture, primary teeth

Introduction

Tooth trauma has been and continues to be a common occurrence that every dental professional must be prepared to assess and treat when necessary. It has no prescriptive method for occurring, possesses no significant predictable pattern of intensity or extensiveness, and has the uncanny knack of occurring at times when dentists are least prepared or when the dental office is closed[1]. It may leave not only physical scars but also psychologic impact on its victim[1]. Amongst the plethora of causes of traumatic injuries to the teeth, sporting activities and trauma due to fall or collision are the commonest[1,2].

The prevalence of traumatic injuries to the primary dentition has differed from study to study and country to country. Retrospective and prospective studies report frequencies ranging from 4-33% of all children[2,3,4,5,6]. Crown-root fractures are relatively rare, comprising approximately 2% of injuries affecting the primary dentition[2].

To efficiently determine the extent of injury and correctly diagnose injuries to the teeth, periodontium, and associated structures, a systematic approach to the traumatized teeth is essential[2]. Examination of traumatic injury cannot be considered complete without appropriate radiographic examination. Radiographs are necessary for documentation and to check baseline status of the primary tooth and supporting structures immediately after the injury. Detailed assessment includes a thorough medical and dental history, clinical and radiographic examination, and additional tests such as palpation, percussion, sensitivity, and mobility. On evaluation of the area of concern extends beyond the dentoalveolar complex, extraoral imaging may be indicated. Treatment planning takes into consideration the patient's health status and developmental status, as well as extent of injuries. Advanced behavior guidance techniques or an appropriate referral may be necessary to ensure that proper diagnosis and care is provided.

Conflict of interest and source of funding
The authors declare that there is no conflict of interest concerning the contents of the study.
This study has been self-supported by the authors.

Case report

A 4½ year old child reported to the Department of Paediatric and Preventive Dentistry, Terna Dental College, complaining of pain in upper front region of the jaw on having hot and cold. Child gave history of trauma due to a fall on a bench in his school 2 days back. After thorough history, any signs of neurological damage were ruled out. Detailed intraoral examination revealed a complicated fracture involving enamel, dentin and cementum in relation to 51 (Fig 1). Fracture line extended 2-3 mm subgingivally with mobile palatal fragment and with obvious pulp exposure (Fig 2). Mobile palatal fragment was well supported by tight gingival collar (Fig 2). No soft tissue laceration or bruising was seen clinically. Radiographic examination revealed transverse fracture line involving pulp and extending to cementum (Fig 3). No abnormality was detected with supporting structures, adjacent teeth and developing teeth on radiograph.

On the basis of clinical and radiographic findings it was decided to opt for conservative treatment option rather than extracting the tooth. Under local anesthesia pulpectomy was performed on 51 taking care not to further damage loose palatal fragment. Canal was obturated with Metapex (META BIOMED Co. Ltd.) below clinical fracture line. Since isolation is always an issue for subgingival restorations, initial stabilization of fractured fragment was carried out using glass ionomer cement. This was followed by composite resin restoration to restore the anatomy of the tooth (Fig 4,5). Patient was prescribed antibiotics and analgesics and was recalled periodically after 1 week, 1 month and 3 months. No obvious clinical symptoms were noted on subsequent clinical examination. Clinical and radiographic examination at 3 months showed no signs of pathology in relation to 51, adjacent teeth and supporting structures. (Fig 6, 7).

Discussion

Injury to the young child's teeth is not only traumatic in the physical sense but also in an emotional and psychologic sense. Many times the distress suffered by child and parent must be managed before the damaged tissues can be evaluated.

Fig 1: Pre operative view

Fig 2: Photograph showing extent of clinical fracture line

Fig 3: pre operative radiograph

Fig 4: Immediate post operative photograph

Fig 5: Immediate post operative radiograph

Fig 6: 3 months post operative photograph

Fig 7: 3 months post operative radiograph

Factors influencing the selection of treatment for traumatized primary teeth include[7]:

1. Relatively short functional period of primary teeth.
2. Close proximity of primary tooth to its developing permanent successor.
3. Difficulty in gaining child's compliance.

The option that has least likelihood to have a deleterious effect on permanent tooth should be considered as the treatment of choice. Usually extraction is the treatment of choice for primary teeth with complicated fracture involving crown and root[7,8]. We decided to save the traumatized tooth by doing pulpectomy than to extract it. A meticulous review of literature reveals that our case report is unique as extraction is the preferred treatment for primary teeth with complicated fracture involving crown and root.

In the present case signs of neurological damage were carefully ruled out before dental treatment. Croll et al[9] has described a rapid and systematic neurologic assessment for dentists to perform which is essential in cases of traumatic injuries. This assessment includes: obtaining any history of any loss of consciousness, cyanosis, or seizure activity; obtaining vital signs; evaluating the patency of airway; observing the signs of rhinorrhoea or otorrhoea; observing the child's motor and communication skills; testing the cranial nerves; and discussing signs of neurologic damage with parent.

With the advent of acid etching and newer composite resins esthetic restoration of traumatized teeth has been made possible. Restoration of pulpectomised 51 in this case was difficult as fracture line was extending subgingivally. Since isolation is difficult in restoring subgingival part, mobile fragment was stabilized using glass ionomer cement placed in subgingival part of the restoration. Rest of the tooth was restored using composite resin.

Subsequent clinical and radiographic examination did not reveal any signs and symptoms of pathology suggesting that it may be possible to salvage a primary tooth with complicated crown-root fracture by careful case selection and proper restoration.

In the primary dentition, the maxillary anterior region is at low risk for space loss unless the avulsion occurs prior to canine eruption or the dentition is crowded. Nevertheless psychologic and emotional trauma can be avoided in young children by using this treatment modality.

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Immediate aesthetic replacement in an adolescent patient: A case report

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Abstract
The minimal preparation resin retained adhesive bridge may be considered an ideal choice of fixed prosthesis to replace a single missing tooth , especially in the anterior region. This most certainly holds true in young patients in whom the treatment has to be kept as conservative as possible. The most important factors to be considered are the preservation of the enamel shield, the dentinal and the pulpal tissues, the preservation of the periodontium and alveolar bone and the predictability of the aesthetics. (Terna J Dent Sci 2012; 1: 47-48.)

Key words: smile design, composite veneers, resin bonded prosthesis.

Introduction

Simple vanity makes most of us desire for the perfect set of teeth.

Hence, the loss of[1] an anterior tooth can affect a person psychologically and socially. This trauma is further aggravated in case of young adults, in whom aesthetic needs are very high; thereby emphasizing the need for an immediate replacement. Conventional fixed prosthodontics is contraindicated,[2] in young patients because of the large size of the pulp, inadequate plaque control, management problems and the fact that children routinely participate in sports. The most important factors to be considered in case of children or young adults are the preservation of the enamel shield and the dentinal and the pulpal tissue, the preservation of the periodontium and the alveolar bone; and the predictability of the aesthetics. The resin retained bridgework would be an ideal[3] choice in such patients as it is minimally invasive and ensures maximum conservation of the tooth structure. The other advantages of this procedure are that it is reversible, can be completed chairside in a single visit thereby avoiding lab costs and also the simplicity of concept and execution.[4] Immediate aesthetic replacement in an adolescent patient: A case report

Conflict of interest and source of funding
The authors declare that there is no conflict of interest concerning the contents of the study.
This study has been self-supported by the authors.

A Case Report

A Fourteen Year Old Male reported to the Department of Prosthodontics (Terna Dental College And Hospital, Nerul,Navi Mumbai)with disturbance in aesthetics owing to the traumatic loss of the maxillary left central incisor. The patient had been to a number of dental practitioners seeking immediate replacement but advised removable prosthesis as a fixed prosthesis was contra indicated because of his age , at the same time , implant prosthesis was not affordable for him. Subsequent intra oral examination revealed a well healed socket with no redness or Inflammation. Radiographic examination revealed that there was no other associated trauma to the remaining dentition and contiguous structures. The patient was not in favour of a removable prosthesis and expressed a need for immediate replacement. He also greatly emphasized on the budget and the time constraints

Treatment Plan

Following thorough clinical and radiographic evaluation, and also taking into consideration the patient's age and time constraints (special care was taken to rule out any traumatic occlusion in, especially in the anterior segment), the following treatment plan was advocated: Maxillary and mandibular diagnostic impressions were made using irreversible Hydrocolloid (Plastalgin) and stock impression trays. An acrylic tooth (21) was selected according to the size most suited to the pontic saddle width. The acrylic tooth was seated on the diagnostic cast in the pontic region with the help of carding wax and then contoured using inlay wax in the region of the contact points and the ridge lap area to simulate the size, form and shape of the natural tooth. A putty index was then fabricated over the modified tooth and the adjacent teeth. Flowable composite was then injected into the putty index, to form a thin layer in the region of the missing tooth and then light cured to form a thin translucent shell simulating the missing tooth's external surface with a hollow centre. The composite shell was then removed from the putty index. It was internally layered with composite and finally finished and polished to form the pontic tooth. The pontic was then placed back on the cast and the final adjustments were made in the interproximal contact areas.

A 3cms long strip of fibre splint was cut from the box roll of Splintmat and sectioned longitudinally into half. The fibre splint was held in the inciso-mesial half of the palatal surface of the maxillary anteriors 11 and 22 and the customized pontic ,the borders were marked on the abutments and the pontics. A small groove was prepared on the palatal aspect of 11and 22 and the

Fig 1

Fig 2

Fig 3

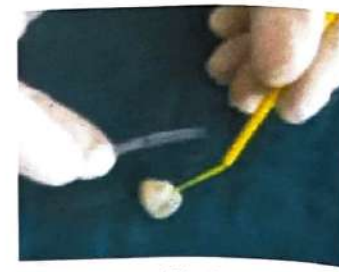

Fig 4

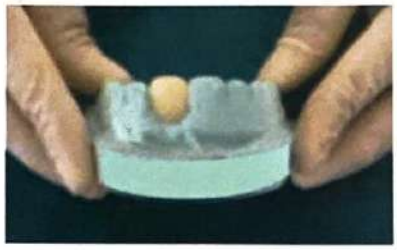

Fig 5

Fig 6

Fig 7

Fig 8

Fig 9

Fig 1 Pre- operative photograph , Fig 2 Fabrication of putty index i.r.t. 21, Fig 3 Composite shell fabrication, Fig 4 Fabrication of composite tooth pontic, Fig 5 Placement of splint on the pontic, Fig 6 Materials used, Fig 7 Post operative intra-oral palatal view, Fig 8 Post operative facial view, Fig 9 Post operative extra-oral view

customized pontic, was slightly roughened using diamond burs. They were then conditioned using the red activator (10% citric acid, 3% FeCl) for 10 seconds and then were rinsed off. The autopolymerising resin (Superbond C&B)polymer, monomer and activator(monomer: activator = 4:1) were mixed and applied on the contact areas using the brush dip technique.

The remaining part of the splint was adhered onto the abutment teeth using flowable composite. The excess cement was removed and the interproximal areas were polished using proximal strips. The patient was given the necessary post operative instructions and was also advised to observe regular recall appointments. The patient was also explained the limitations of the resin retained prosthesis which are due to occlusal factors e.g.: bruxism or biting on hard food and trauma from contact sports or accidents.[5]

Discussion

It is generally recognized that the speciality of fixed prosthodontics is based on sound physical and biomechanical principles. One of the basic principles of tooth preparation is maximum conservation of tooth structure and this is the primary advantage of the resin retained prosthesis. This prosthesis proves more advantageous in children or young adults with single missing anterior tooth. Therefore even with a hesitant and suspicious patient, confidence can be easily cultivated and enhanced easily than the conventional bridgework. This technique is also less arduous and more economical. With careful case selection, precise treatment planning and technical skill, a resin retained bridgework can prove extremely rewarding The same prosthesis can also be repaired and repeated with ease. Likewise, the patient should also be assured that, if, under unfortunate circumstances, failure of the prosthesis occur then it can easily be replaced by a conventional fixed prosthesis.

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Loss of Wisdom – Promises To Regenerate Knowledge of Stem Cells This Far...and Beyond

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Abstract

While the regeneration of a lost tissue is known to mankind for several years, it is only in the recent past that research on regenerative medicine/ dentistry has gained momentum and eluded the dramatic yet scientific advancements in the field of molecular biology. The evidence gathered so far has propelled many elegant studies exploring the role of stem cells and their manifold dental applications. This review discusses the various challenges and barriers that we have to surmount before translating laboratory results to successful clinical applications heralding the dawn of regenerative dentistry. **(Terna J Dent Sci 2012; 1: 49-53.)**

Key words: stem cells, stem banking, tooth regeneration, DPSC

Introduction

In the new millennium where biology and biotechnology have replaced chemistry we are exploring biological solutions to biological problems. Although stem cell technology is just emerging, the regeneration of the body parts is hardly a new concept. Regenerative capability of a living creature was observed as early as 330 BC when Aristotle observed a lizard could grow back its lost tip of the tail. It is time to familiarize ourselves with the following – stem cells, their characteristics, their potential applications, harnessing of stem cells, current research , translating to therapy and unknown areas so far.[1]

Stem Cells And Their Characteristics-

Stem cells was the term proposed for scientific use by the Russian histologist "Alexander Maksimov" in the year 1908. These are biological cells in all multicellular organisms that can divide through mitosis and
differentiate into various specialized cell types and can self renew to produce more stem cells. Based on their origin , stem cells are categorized either as embryonic stem cells (ESC), or post natal stem cells /adult stem cells (ASC).[1]

Characteristics Of Stem Cells[1]

1. Totipotency-generate all types of cells including germ cells. (ESC)
2. Pluripotency- generate all types of cells except cells of the embryonic membrane.
3. Multipotency- differentiate into more than one mature cell.(MSC)
4. Self renewal- divide without differentiation and create everlasting supply.
5. Plasticity- MSC have plasticity and can undergo differentiation. The trigger for plasticity is stress or tissue injury which up-regulates the stem cells and releases chemoattractants and growth factors.

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

This study has been self-supported by the authors.

Embryonic Stem Cells- These are derived from embryos that are 2- 11 days old called blastocysts. They are totipotent. ESC are considered immortal as they can be propagated and maintained in an un-differentiated state indefinitely. These stem cells have the highest potential to regenerate and repair diseased tissue and organs in the body.

Adult Stem Cells- These are found in most adult tissues. They are multipotent . The plasticity of an adult stem cell is described as its ability to expand beyond its potential irrespective of the parent cell from which it is derived. For example – dental pulp stem cells not only develop into tooth tissue but also have the ability to differentiate into neuronal tissue.

The Adult Stem Cells Can Be Recovered From The Following -

Bone marrow derived mesenchymal stem cells – Bone marrow transplants were the first successful stem cell therapies. A bone marrow transplant involved a donor and recipient with a close cellular matrix. Presently peripheral blood stem cell collection is being used in place of bone marrow aspiration.[2]

Adipose derived adult stem cells have also been isolated from human fat, usually by method of liposuction.[2]

Umbilical cord stem cells- derived from the blood of umbilical cord.[2]

Amniotic fluid –derived stem cells can be isolated from aspirates of amniocentesis during genetic screening or collection at the time of delivery.[2]

Induced pluripotent stem cells derived from epithelial cells- these are not adult stem cells , but rather reprogrammed epithelial cells with pluripotent capabilities.[2]

Dental stem cells are the most accessible stem cells - They are isolated from the dental pulp of healthy teeth both primary and permanent teeth, periodontal ligament including the apical region of the developing teeth and other tooth structures, craniofacial stem cells, including dental stem cells, originate from the neural crest cells and mesenchymal cells during development.[2]

In a child the most accessible stem cells are from the oral cavity. For deciduous teeth, the best candidates are canine and incisors with the presence of healthy pulp that become mobile and are about to exfoliate. In children other sources for easy accessible stem cells are supernumerary teeth, mesiodens, over retained deciduous teeth

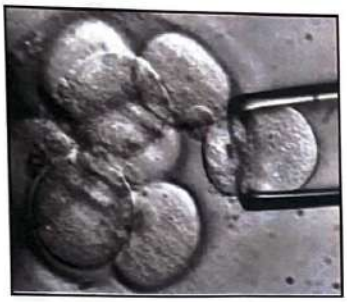

Fig 1 – Stem cells

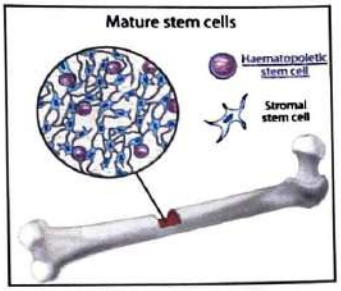

Fig 2- Stem cells in bone marrow

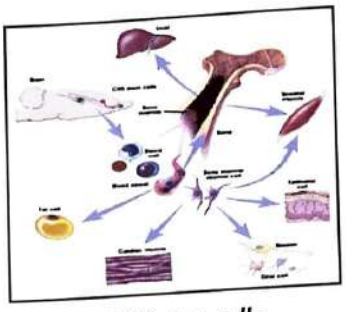

Fig 3- Adult stem cells

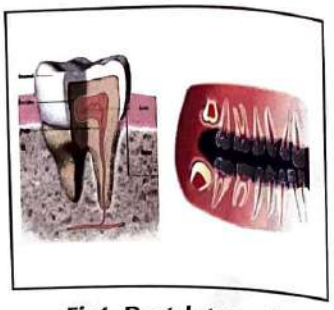

Fig4- Dental stem cells sources : dental pulp and wisdom tooth

and prophylactic removal of deciduous molars for orthodontic indications.[2]

Adolescents have two excellent opportunities for banking their stem cells from extracted teeth- following orthodontic extraction of bicuspid teeth for orthodontic treatment and when their wisdom teeth are extracted. Typically these teeth are extracted for orthodontic reasons before the roots are fully formed, which ensures a better chance for success of harvesting viable stem cells.

Dental Stem Cells And Other Stem Cell Sources For The Development Of Teeth In Vitro Or Ex Vivo

As tooth formation results from epithelial – mesenchymal interactions , two different populations of stem cells have to be considered, epithelial stem cells which give rise to ameloblasts and mesenchymal stem cells that will form the odontoblasts , cementoblats, osteoblasts and fibroblasts of the periodontal ligament. Thus tooth engineering using stem cells is based on their isolation, association and culture as recombinants invitro or exvivo conditions to assess firstly tooth morphogenesis and secondly cell differentiation into tooth specific cells that will form dentin, enamel, cementum and alveolar bone.[3]

Mesenchymal stem cells- the potential of dental MSC for tooth generation and repair has been extensively studied in the last few years. Mesenchymal progenitors have been assessed for tooth engineering purposes such as progenitor derived from teeth and bone marrow and are discussed below-

Stem cells from human exfoliated deciduous teeth(SHED)- The isolation of post natal stem cells from an easily accessible source is indispensable for tissue engineering and clinical appli-cations. Recent findings demonstrated the isolation of mesenchymal progenitors from the pulp of human deciduous incisors. These exhibited a high plasticity since they could differentiate into neurons, adipocytes, osteoblasts and odontoblasts.[3]

Adult dental pulp stem cells(DPSC)- After a dental injury, dental pulp is involved in a process called reparative dentinogenesis, where cells elaborate and deposit a new dentin matrix for the repair of the injured site. Dental pulp progenitors have not been clearly identified but some data suggest that pericytes , which are able to differentiate into osteoblasts, could also differentiate into odontoblasts.[3]

Stem cells from apical part of the papilla(SCAP)- These cells from the apical part of the human dental papilla have been isolated and their potential to differentiate into odontoblasts was compared to that of the periodontal ligament stem cells (PDLSC). SCAP exhibit a higher proliferative rate and appears more effective than PDLSC. SCAP is easily accessible since they can be isolated from human third molars.[3]

Stem cells from the dental follicle(DFSC)- These have been isolated from follicle of human third molars and express the stem cell markers notch1, STRO-1 which can differentiate into cementoblasts in vitro and are able to from cementum in vivo .Immortalized dental follicle cells are able to create a new periodontal ligament.[3]

Periodontal ligament stem cells(PDLSC)- The PDL is a specialized tissue located between the cementum and the alveolar bone and has a role in maintenance and support of the teeth. PDL contains progenitors, which can be activated to self renew and regenerate other tissues such as cementum and alveolar bone.[3]

Bone marrow derived mesen-chymal stem cells(BMSC)- These have been tested for their ability to recreate periodontal tissue. These cells are able to form in vivo cementum, PDL, and alveolar bone after implantation into defective periodontal tissues.[3]

Association Of Epithelial And Mesenchymal Stem Cells

Since teeth are formed from two different tissues, building a tooth logically requires the association/ cooperation of odontogenic, mesenchymal and epithelial cells. Making an entire teeth with enamel and dentin structures in vivo is a reality and not a utopia. However, these bioengineered teeth have been produced in ectopic sites and are still missing some essential elements such as complete root and periodontal tissues that allow correct anchoring into the alveolar bone. Recently a new approach has been proposed for growing teeth in the mouse mandible (Nakio et al 2007). In this study epithelial and mesenchymal cells were sequentially seeded into a collagen gel drop and then implanted into the tooth cavity of adult mice. With this technique, the presence of all adult structures such as the odontoblasts, ameloblasts, dental pulp, blood vessels, crown, periodontal ligament, root and alveolar bone could be observed. Thus the implantation of these tooth germs in the mandible allowed their development, maturation and eruption indicating that stem cells could be used in the future for the replacement of missing teeth in humans.[3]

Potential Applications In Medicine

Stem cells are being explored for a variety of chronic debilitating diseases that have so far escaped remedial measures from traditional allopathic approaches with a hope that cell therapy would repair, repopulate, replace, and rewire tissues and organs regenerating hope and kindling confidence in such therapies.[1]

Various therapeutic programs in either pilot or proof of concept studies are exploring the role of cell replacement therapy under conditions like Parkinsons disease, Cancer, Arthritis, Diabetes, and Peripheral vascular disease . Clinical trials for repair of heart tissue following a heart attack, repair of lung tissue in Chronic Obstructive Pulmonary Disease are being undertaken.[1]

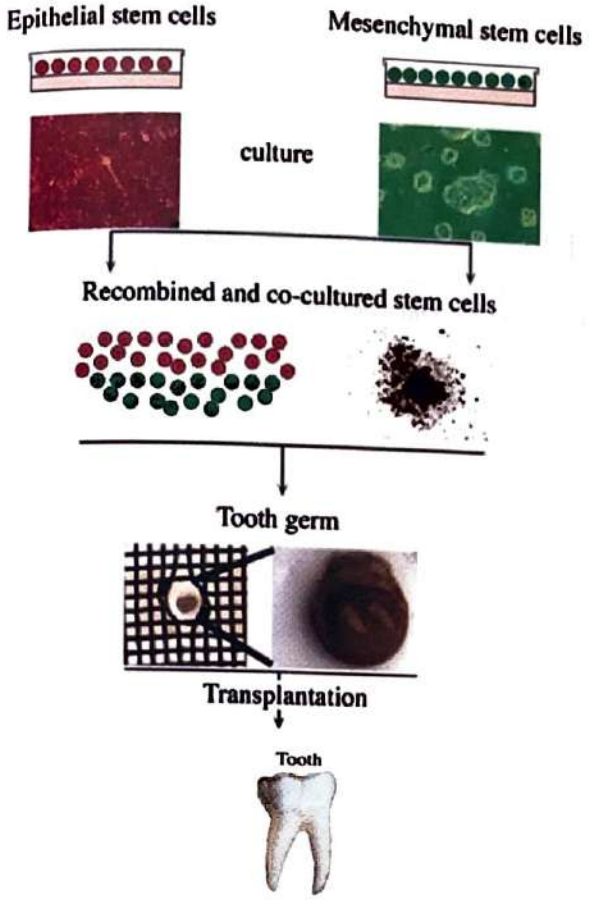

Fig 5- Use of stem cells for tooth formation in vitro and ex vivo. A tooth germ can be created in vitro after co-culture of isolated epithelial and mesenchymal stem cells. This germ could be implanted into the alveolar bone and finally develop into a fully functional tooth.

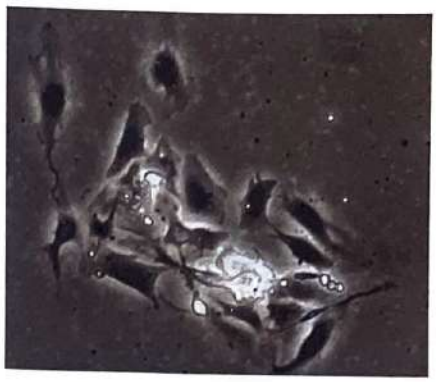

Fig 6- stem cells in deciduous tooth source for stem cells

Fig 7- lower wisdom tooth

Potential Applications In Dentistry[1,4,5,7]

Regeneration Of Damaged Coronal Dentin And Pulp

To this date no restorative material has been able to mimic all physical and mechanical properties of tooth tissue. If the regeneration of tooth tissue is possible in these situations, it facilitates physiologic dentin deposition that forms an integral part of the tooth thereby restoring structural integrity, minimizing interfacial fractures, microleakage, etc.

Periodontal Regeneration

Due to complex structure of the periodontium (consisting of hard and soft tissues), its complete regeneration has always remained a challenge. All the current regenerative techniques such as autologous bone grafts, or alloplastic materials have limitations and cannot be used in all clinical situations. Therefore, a cell mediated bone regeneration technique will be a viable therapeutic alternative.

Repair And Regeneration Of Bone In Craniofacial Defects

Craniofacial bone grafting procedures rely on autologous bone grafting, devitalized allogenic bone grafting and natural osteoconductive materials. If stem cells can be harvested in a scaffold and transplanted to the defect it can enable regeneration of the lost tissues. Cell derived therapy for the repair of osseous defects has been relatively successful.

Whole Tooth Regeneration

A therapeutic option was unthinkable a few years ago seems to be an achievable goal today. Even to this day, the replacement of missing teeth has limitations. Although, Implants are a significant improvement over dentures and bridges, their fundamental limitation is that they rely on direct integration of bone on tooth surface which is indeed an unnatural relationship.

Role Of Oral Surgeons In Harnessing Stem Cells

Surgical removal of wisdom tooth that are malposed/impacted- which may be carious or non carious is something that is handled in bulk on a daily basis by oral surgeons. In fact, the surgical removal of the tooth would be a routine procedure by an oral surgeon, who can play an important role in sample collection for the purpose of Harnessing stem cells from wisdom tooth. The extracted teeth are an abundant source of Adult stem cells- DPSC (dental pulp stem cells).

Advantages Of Stem Cells From Wisdom Tooth[8]

1. Third molars have abundant (about 20%) source of stem cells in their pulp tissue.
2. Third molars can be frozen and yet can be a source of stem cells later in life.
3. Stem cells from wisdom tooth are better as they expressed TERT (Telomerase reverse tran-scriptase) a protein which is crucial for cell division and growth. TERT is not found in stem cells from bone.
4. No ethical issue compared to embryonic stem cells(loss of embryo).
5. Stem cells from third molars can differentiate into bone, cartilage, adipose tissue, cornea and cardiac muscles.

Sample Collection For Harnessing Stem Cells

The extracted tooth sample is collected and transported in a 5 ml conical tube containing transport media which consists of Dulbecco's phosphate buffered

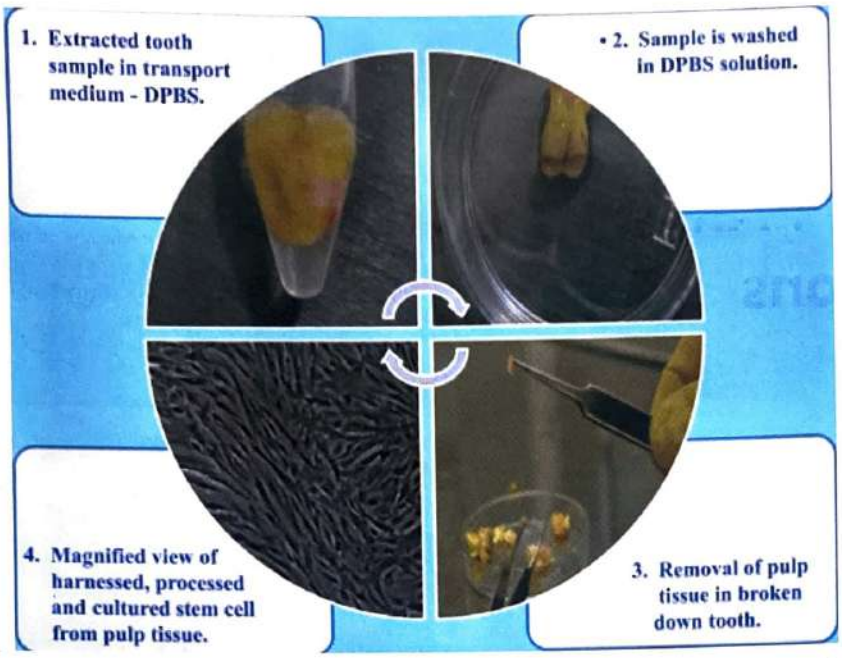

Fig 8- Sample collection for harnessing stem cells and processing of dental pulp stem cells

saline(DPBS) solution with 1% antimycotiv and penicillin/ streptomycin[6].

Processing And Culturing Of DPSC[6]

1. The tooth sample is washed with DPBS Solution, broken using sterile hammer, and the pulp is carefully removed from the pulp chamber and minced using a surgical scalpel followed by treating the tissue sample with collagenase blend.
2. The tissue is then incubated at 37° C in presence of 5% CO2 for 48 hours followed by a change of media.
3. The processed tissue is cultured in a 24 well plate. Trypsin (0.25%) is used to detach the cells from the surface of the tissue culture dish and Haflicks method of sub-culturing is followed to subculture the cells.

So Far - Unknown Areas Signaling Molecules

There are many growth factors that play a role in tissue regeneration. The demineralization of dentin tissue due to caries can itself lead to the release of growth factors. Once released these factors play a role of signaling many of the events of tertiary dentinogenesis . Although we know the role played by these signaling molecules, we are yet to have a clarity on how these signals can be spatially distributed in a right combi-nation of time and sequence which indeed is crucial to obtain predictable results. Stem cells obtained from any adult tissue are less about 1-4 %. Further their isolation, expansion, and storage, is a very technique–sensitive procedure. When banked, how long can they be safely stored retaining the original stemness is still not exactly determined.[1]

Scaffold Design and Delivery- Enhanced vascularisation is needed in order to support the vitality of the implanted cells in the scaffold. Efforts are on in developing a scaffold with growth factors like vascular endothelial growth factor(VEGF). These techniques are particularly important for pulp tissue engineering as the blood supply is only from the apical end.[1]

Conclusion

We as oral surgeons are proud of the fact that loss of wisdom (tooth) – promises to regenerate; regeneration of the dental tissues provides an attractive alternative to more traditional restorative approaches because the diseased tissue is replaced by natural tissue, which forms an integral part of the tooth. Through the use of stem cells from extracted third molars, oral surgeons would be able to lend their hand and expertise in restorative dentistry. We clearly have an opportunity to move restorative dentistry to a new era. By harnessing the biological activity of the dental tissues to facilitate wound healing and tissue regeneration is a promising future potential.

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Periodontal & Peri-implant Tissue Engineering : An Update with Future Directions

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Abstract

Regenerative medicine & tissue engineering technologies have greatly benefitted medicine & dentistry over the past years. The current line of thinking, futuristic points of views and ongoing experiments utilizing the rapidly progressing technology have made the overall picture more optimistic. This review attempts to provide current status of strategies attempting to regenerate tissues predictably around tooth & implants by tissues engineering. The article also summarizes a few futuristic applications that hold the key to interesting and more promising times ahead.**(Terna J Dent Sci 2012; 1: 53-54.)**

Key words: Periodontal regeneration, tissue engineering, stem cells, dental implants, biomimetics, osseo-integration.

Introduction

Tissue engineering emerged as a new paradigm and as an alternative approach to tissue and organ reconstruction approximately three decades ago. The mainstay of tissue engineering is to regenerate patient's own tissues and organs and at the same overcoming the issues of biocompatibility and biofunctionality as well as severe immune rejection. These outstanding advantages make tissue engineering an ideal medical treatment.

Tissue engineering utilizes three basic tools to regenerate new tissues- cell, scaffold and growth factor. Remember that these three are not always simultaneously used. For example it is sufficient to use only bone morphogenetic protein (BMP), for some bone tissue engineering. Skin or dermal tissue can be regenerated just by placing a porous collagen sheet on a full-thickness skin wound. One need not incorporate cell seeding and growth factor delivery.

It all started around 1980 and one of the earliest clinical applications was for the skin tissue. Later the application spread into Guided Tissue Regeneration (GTR) and Guided Bone Regeneration (GBR) in dentistry.

Conflict of interest and source of funding

The authors declare that there is no conflict of interest concerning the contents of the study.

This study has been self-supported by the authors.

Terminology:[1]

When two US research groups achieved success in establishment of human embryonic stem (ES) and embryonic germ (EG) cell lines in 1998, a new term 'Regenerative Medicine' appeared.

There is some confusion in application of the terms - 'tissue engineering', 'regenerative medicine', 'cell (cellular) therapy' and 'cell transplantation', which can be differentiated on the basis of scaffolds. (Fig. 1)

Cells:[1]

There are three sources: Autologous (patient's own), allogenic (another human) and xenogenic (nonhuman animal). Autologous cells are the most appropriate due to their high biologic activity and no immunological concerns. Cells of allogenic and xenogenic origins are immunogenic.

Another classification names the stem cells based on their stage of differentiation. (Fig. 2)

Stem cells most practical for tissue engineering are somatic (or adult) stem cells. Haematopoietic Stem Cells (HSC) and Mesenchymal Stem Cells (MSC) are the most well studied stem cells. When combined with knowledge of growth factor and cytokine that promote differentiation, and appropriate scaffold or carrier for delivery to a specific tissue site, Mesenchymal Stem Cells (MSC) appear to be the ideal candidate cells for tissue engineering and regeneration.

Implanted Periodontal Ligament Stem Cells (PDLSCs) generate Cementum & Periodontal Ligament like structures similar to the native periodontium.[2]

Recent advances:

1. Bioroot : Sonyama et al[3] combined PDLSCs with stem cells from root apical papilla and generated a "bioroot" structure encircled with PDL tissue.
2. Ligaplant : Autologus PDLSCs taken from extracted teeth when transplanted on to Titanium implant surfaces formed bone-to-implant ligament attachments. These were called Ligaplants that allowed functional loading for extended periods of time.[4]

The question is when implants are showing excellent long term survival rates, why add a ligament that may contribute to progressive bone loss?[5]

The answer lies in the evidence that has demonstrated a more rapid bone loss at the osseointegrated peri-implant interface as compared to tooth- bone interface. So it becomes advisable to include a ligament.[6]

But there are challenges and counter-arguments to ligaplants.

a. Challenges- procurement of autologus cells, costs, time, and regulatory requirements.[5]
b. Counter – argument: Marginal bone loss around immobile and asympto-matic implants is not an automatic sign of osseous disease presence, even when threads are exposed and inflammatory gingivitis is present. It may be tempting

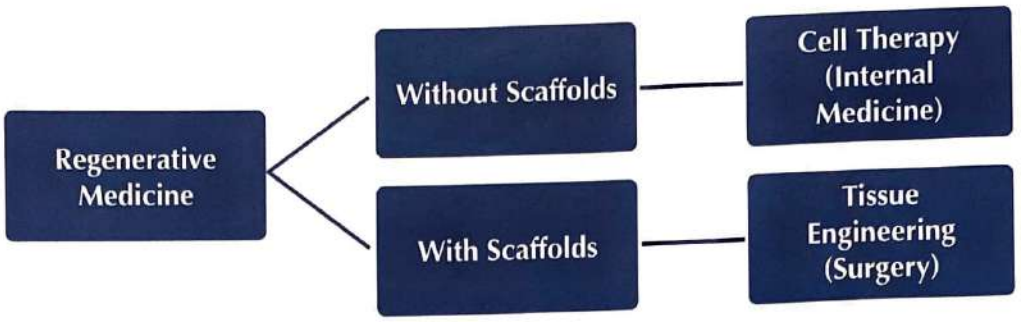

Fig.1

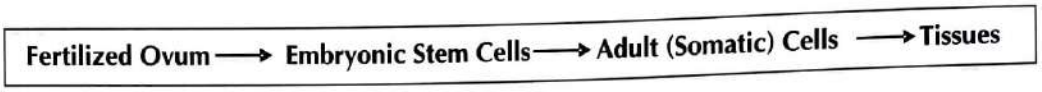

Fig.2

for the dentist to employ a catchy term for such a clinical picture, but implying that this is a disease process that demands treatment intervention is intellectually and professionally indefensible.[7]

Scaffolds:[1]

Cells are necessary for regeneration but alone not sufficient to create the distinct three-dimensional form, for which they will require a specific kind of support. The support is called scaffold, template, or artificial extracellular matrix (ECM). The scaffold assists in proliferation, differentiation, and biosynthesis of cells and at the same time prevents the invasion of disturbing cells into the site of action.

The most critical things for scaffolds are optimal mechanical properties for stabilization at the site and optimal porosity. The low tearing strength of soft porous biomaterials like collagen does not allow them to endure fixation with suture. Non-woven PGA fabrics can be readily fixed by suturing, but their porosity is so high that cell entrapment becomes difficult. Third critical factor for scaffolds is their resorption rate.

Recent advances:

1. Extracellular matrix administration:[8] The ultimate goal of periodontal tissue regeneration is to reconstruct the Periodontal ligament that will sustain the required mechanical force to connect with mineralized tissues such as cementum and alveolar bone. The extracellular matrix (ECM) administration therapy is a new therapeutic strategy in periodontal tissue regeneration therapy in addition to the stem cell transplantation and cytokine administration. ECM administration therapy is likely to play a dual role of regeneration of periodontal tissue as well as attenuation of tissue degradation signaling events.

2. New generation of scaffolds:[2] CT scan & MRI data are taken to create three dimensional models through image based designing on computers. These printed scaffolds precisely fill the defect space. Plus the surface topography can be altered to modify the biological properties to address specific periodontal functional requirements such as PDL fiber orientation & tissue integration.

Growth factors:[1]

They are a range of proteins that play a key role in proliferation and differentiation of cells, eg. bone morphogenetic proteins (BMPs), basic fibroblast growth factor (b-FGF or FGF-2), vascular epithelial growth factor and transforming growth factor-β (TGF-β). One can imagine the remarkable capability of growth factors from the fact that BMP and b-FGF alone can induce bone and vascular tissue regeneration, respectively, without employing any scaffold or seeded cells.

Recent advances:

1. Biomimetics:[9] involves biologists and engineers jointly endeavoring to produce bioinspired materials which literally mimic the biology for tissue engineering. Attempts are on to develop an osteoinductive implant by incorporating osteogenic growth factors into calcium phosphate coatings deposited biomi-metically upon titanium implants. The ultimate goal is to produce implants that are osteoinductive (growth factors) as well as osteoconductive (calcium phosphate layer).

2. Neovascularization:[1] A lot of work is being done using various growth factors to induce neovascularization to supply sufficient amounts of nutrients to the cells involved in tissue regeneration.

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