It is actually giving me immense pleasure to write this editorial since the present issue got delayed due to some unavoidable reasons and it, in fact, led to wide clandestine support to bring it forth.
Rest assured, I thank Almighty to provide me chance to keep-up to the expectations of the readers.
I wish for many more improvements to come, suggestions to come, readability to increase so that the very purpose of bringing this endeavor forth shall be served.

Wish you luck and an intellectual journey ahead in life.

With best regards,
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Calcium Enriched Mixture (CEM): A New Endodontic Cement

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Abstract: Calcium enriched mixture (CEM) is new endodontic cement introduced recently in the year 2006 at Iranian Center for Endodontic Research, Shahid Beheshti University of Medical Sciences, Tehran, Iran. It possesses an alkaline pH (pH >10.5) and releases calcium hydroxide during and after setting. The anti-bacterial properties of CEM are comparable to calcium hydroxide (CH). The sealing ability, cytotoxicity and biocompatibility of CEM are, also, comparable to MTA. The scanning electron microscope (SEM) surface characteristics of set CEM are comparable to human dentin. CEM has the ability to promote hydroxyapatite formation even in normal saline solution.

Key words: calcium enriched mixture (CEM), new endodontic cement, MTA

Introduction: Calcium-based chemicals have been used in the clinical practice of dentistry for over a century. Calcium hydroxide was introduced to endodontic practice by Herman in the year 1920 for its pulp repairing ability. The clinical use of calcium hydroxide as a root canal filling material was first introduced by Rhoner in the year 1940. It took another 20 years for calcium hydroxide to become popular for apexification procedures, the sealing of perforations and management of resorptions. Super EBA, Cavit and Mineral Trioxide Aggregate (MTA) have been used with different degrees of success in the endodontic practice. Several studies done on MTA, as a relatively new material, have shown excellent biocompatibility, too. However, long setting time, difficulty in handling and relatively high price are some of the main disadvantages of MTA.[1-4] To overcome this, new material called calcium enriched mixture was introduced. Calcium enriched mixture (CEM) is a new endodontic cement introduced recently in the year 2006 at Iranian Center for Endodontic Research, Shahid Beheshti University of Medical Sciences, Tehran, Iran. It possesses an alkaline pH (pH >10.5) and releases calcium hydroxide during and after setting. The anti-bacterial properties of CEM are comparable to calcium hydroxide (CH). The sealing ability, cytotoxicity and biocompatibility of CEM are, also, comparable to MTA.[5-7] The scanning electron microscope (SEM) surface characteristics of set CEM are comparable to human dentin. CEM has the ability to promote hydroxyapatite formation even in normal saline solution.[8-11]

Composition: Calcium enriched mixture (CEM) is a new tooth-colored, water-based endodontic biomaterial mainly composed of:
Calcium oxide (CaO): 51.75 %wt.;
Sulfur trioxide (SO_3): 9.53 %wt.;
Phosphate (P_2O_5): 8.49 %wt.; and
Silica (SiO_2): 6.32 %wt with additions of Al2O3> Na2O >MgO> Cl as minor components. When mixed with water-based solution, bio-active calcium and phosphate enriched material forms which contains Calcium phosphate, Calcium hydroxide, Calcium sulfate, Calcium silicate, Calcium chloride, Calcium carbonate and Calcium oxide.[6,7]

Mechanism of Action: CEM is available as a white powder mixture consisting mainly of hydrophilic particles that set in the presence of water base solution. When mixed with water

based solution, hydration reaction of powder creates a colloidal gel that solidifies in less than 1 hour and forms hydroxyapatite crystals. The results of recent studies indicate that mixed CEM cement releases calcium and phosphate ions and then, forms hydroxyapatite not only in simulated body tissue fluid but, also, in normal saline solution.[6,7] The similar phenomenon, also, explains the antimicrobial property of CEM by increasing the pH upto 11.[12,13]

Indications: The clinical uses of CEM are the same as MTA. They have similar working time, pH and dimensional stability. CEM has significantly more anti-bacterial properties than MTA.[13,14] CEM can stimulate hard tissue healing and can set in humid environments.[9,11] It has appropriate setting time and good handling characteristics and it has an excellent seal when used as a root-end filling material.[15,16] It, also, acts as a good pulp protecting agent during pulpotomy procedures.[17,18] When compared as a pulp capping agent, MTA and CEM are found to be equally effective although CEM displays slightly superior characteristics to MTA when considering its ability to form hydroxyapatite as well as similarity to dentin.[19] Histological observations after repair of furcal perforations with CEM have shown not only a re-establishment of the normal periodontium but, also, cementogenesis over the material.[20] CEM has, also, shown favourable results in apexogenesis like apical plug formation during apexification.[21,22] One-visit application of CEM cement could be a successful approach for the management of external as well as internal root resorptions. The clinical use of CEM is approved by the Iranian Ministry of Health and Medical Education and is used for root end filling[15,16], direct pulp capping[17,18], furcation repair[20], external root resorption repair, apexogenesis and apexification[21,22].

Properties: CEM provides a working time of 5 minutes and a setting time of less than 1 hour which is better than MTA.[5,6] Numerous in-vivo studies have proven CEM superior to stimulate dentinogenesis after direct pulp capping procedures, pulpotomy procedures in animals and humans[17,18], in promoting cementogenesis after perforation repairs[20] and in apexogenesis and apexification[21,22]. These all implications of CEM could be attributed to its excellent ability to form hydroxyapatite crystals in moist conditions and while in contact with the tissues and body fluids.[11,12] One of the interesting radiographic features in cases treated by CEM is formation of normal periodontium indicating biocompatibility of the CEM. This feature can, in turn, be attributed to the low cytotoxic effect of CEM cement on different cell lines which promotes osteogenesis and cementogenesis allowing regeneration of the periodontal ligament around the site of injury.[13,14,20] The other important properties of CEM include its ability to form an excellent physical and biological seal.[15,16] In addition to these, the particle size of CEM which predominantly ranges from 0.5µm-2.5µm gives it some strategic properties like more flow (in comparison to MTA), reduced film thickness and a shorter setting time. Furthermore, a recent SEM study showed that distribution pattern of calcium, phosphorus and oxygen in the surface of the CEM cement was comparable to that of the surrounding dentin. Hydroxyapatite is a main component of dentin; therefore, similarity between CEM and dentin might help the cementogenesis.[8-12]

Advantages: The major advantages of CEM which make it the material of choice over the gold standard MTA include its high anti-bacterial effect[13], greater sealing ability[15,16] and an inherent ability to induce and mimic the composition of formed hard tissues[8-11]. The unique property of hydroxyapatite formation over resected root end and root end filling surfaces[11,15,16] and similar surface characteristics to that of dentin (an important property as a root end filling material)[8-11], being economical, good handling characteristics with better flow, a setting time of less than 1 hour and lesser film thickness, an ability to form hydroxyapatite crystals even in saline solution[6,7], low cytotoxic effect[13,14], meagre dimensional changes are other added advantages. CEM releases calcium and phosphorus ions from indigenous sources resulting in a rich pool of OH-, Ca2+ and PO4- ions which not only provide high anti-bacterial effect[12,13] but, also, an ability to set while in contact with the tissues and body fluids during the process of hydroxyapatite (HA) production[6,7]. The greatest distribution of CEM particle size is within 0.5-2.5 µm range (25.7%) allowing penetration of particles into the dentinal tubules and therefore, providing a better seal.[3,15,16] The higher presence of small size particles in CEM cement might, also, explain the shorter setting time, better flow and

also, less film thickness of this dental material which has been demonstrated previously.[6,7]

Conclusion: CEM materials appear not only to demonstrate acceptable biocompatible behaviour but, also, exhibit acceptable in-vivo

biologic performance when used for root-end fillings, perforation repairs, pulp-capping and pulpotomy procedures and apexification. However, it should be noted that the supporting data have been overwhelmingly from either in-vitro or, animal studies. Reports have strongly suggested that the favourable biologic performance exhibited by CEM materials is due to hydroxyapatite formation when these materials are exposed to physiologic solutions. Although some studies suggest that the less-expensive CEM could possibly be used in place of MTA, further studies are warranted. CEM is more adaptable as its surface resemblance to dentin is more than that with MTA and while some reports suggest that CEM may invoke a more desirable biologic response than MTA, further studies are encouraged. Although the overall results in human studies involving CEM materials are very positive, further, longitudinal studies are encouraged as at present insufficient well-designed and controlled clinical studies exist that allow systematic and meta-analysis review of CEM materials in all of its suggested clinical indications.

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Multiple Compound Odontomes: A Case Report

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Abstract: Odontomes are the most common odontogenic tumors representing 70% of the odontogenic tumors. Odontomes are often stated as hamartomatous tumors rather than being true odontogenic tumors as they are formed due to proliferation of both epithelial and mesenchymal components of the dental hard tissues. The exact etiology of odontomes is still unknown, however, local trauma such as when the primary dentition is traumatized during the developmental stages of succedaneous teeth is considered one of the most common etiologies behind their occurrence. The present case report describes a similar case of multiple compound odontomes associated with an unerupted permanent maxillary central incisor.

Key words: Multiple Compound Odontomes, hamartomas, true odontogenic tumors

Introduction: Odontomes are the most common odontogenic tumor representing 70% of the odontogenic tumors.[1] Odontomes are, often, stated as the hamartomatous tumors rather than being true odontogenic tumors as they are formed due to proliferation of both epithelial and mesenchymal components of dental hard tissues.[2] They are non-aggressive tumors often associated with other odontogenic cysts and tumors.[3] Odontomes are broadly classified as compound and complex odontomes. Compound odontomes are twice as common as complex odontome.[4] Compound odontome present as multiple small tooth-like structures whereas compound odontome are often seen as irregular con-glomerulates of enamel, dentine and pulp which do not resemble morphologically as tooth-like structures.[1] They are often asymptomatic and associated with impacted, embedded and/or, over-retained teeth which are diagnosed as incidental findings on routine radiography.[5] Occasionally, they might be associated with swelling and/or, secondary infections. The most common location for odontomes is anterior maxilla.[4,5] The exact etiology of odontomes is still unknown, however, local trauma such as when the primary dentition is traumatized during the developmental stages of succedaneous teeth is considered one of the most common etiologies behind their occurrence with their future growth being affected due to the close relationship between the apices of primary teeth and the buds of developing permanent teeth. Odontomes might be associated with a plethora of hereditary anomalies such as Gardner's and Hermann's syndrome and rarely, the so-recognized odontoma dysphagia syndrome. Alteration in the genetic component has, also, been related to the

occurrence of odontomes.[6-9] The present case report describes a similar case of multiple compound odontomes associated with an unerupted permanent maxillary central incisor.

Case Report: A 12 years old child patient reported with the chief complaint of missing upper front tooth. There was no relevant medical or, dental history and it was patient's first dental visit. Any history of trauma was not revealed. Intra-oral examination revealed permanent dentition with unerupted left maxillary permanent central incisor and a slight bulge in the same region. (Fig.1) On the basis of clinical findings, a provisional diagnosis of partial anodontia with 21 was made. Considering the factors that are responsible for missing/unerupted teeth, differential diagnoses included the highly common trauma-induced degeneration of the developing tooth bud, ankylosis, odontome, adenomatoid odontogenic tumor (AOT) and dentigerous cyst in addition to a plethora of the more common odontogenic tumors including unicystic ameloblastoma and ameloblastic odontoma and fibro-odontoma though with rare occurrence. Radiographic examination was advised to verify for any such reason. The intra-oral periapical radiograph (IOPAR) revealed presence of impacted tooth associated with multiple small tooth-like structures with a surrounding radiolucent zone overlying the crown in relation to 21. (Fig.2) Orthopantomograph (OPG) did not show evidence of radiopaque foci/structure in any other region in the jaws. (Fig.3) On the basis of the radiographic findings, a radiographic diagnosis of compound odontome was made and the patient was subjected to surgical removal of the odontome under local anesthesia. Excision of the tooth mass overlying the crown yielded multiple small tooth-like structures of different sizes and shapes. The specimen was sent for histopathological examination. Histopathological examination revealed presence of denticles surrounded by a fibrous connective tissue with a mass of pulp tissue in a perforated pattern confirming a histopathological diagnosis of compound odontome in accordance with the radiographic one. On the basis of clinical, radiographic and histopathological examination, a final diagnosis of compound odontome with impacted maxillary left central incisor was made. The patient was re-called after 7 days for a repeat radiographic examination (intra-oral periapical radiograph (IOPAR): Fig.4) and was kept under regular follow-up to observe the response of treatment following excision of the odontome and any possible recurrence with the normal eruption of the previously impacted maxillary left central incisor.

Discussion: The factors responsible for missing/unerupted teeth include the highly common trauma-induced degeneration of the developing tooth bud, ankylosis, odontome, adenomatoid odontogenic tumor (AOT) and dentigerous cyst in addition to a plethora of the more common odontogenic tumors including unicystic ameloblastoma and ameloblastic odontoma and fibro-odontoma though with rare occurrence. Amongst these, trauma is considered to be the most common etiological factor followed by odontomes.[10] The term odontoma was coined by Paul Broca in the year 1867. It was defined as a tumor formed by the overgrowth of complete dental tissues. In a broader sense, it means growth of epithelial as well as mesenchymal components exhibiting complete differentiation into formed enamel and dentin though in an abnormal pattern. Furthermore, this is because the organization of odontogenic cells fails to reach the normal state of morpho-differentiation.[10] The most common clinical

signs associated include delayed eruption of permanent teeth with or, without over-retained primary teeth.[1,4,5] Occasionally, swelling and signs of secondary infection and regional lymphadenopathy might be seen.[11] According to WHO classification, odontomes are divided into three groups including complex odontomes when the calcified dental tissues are arranged in an irregular mass bearing no morphologic similarity to rudimentary teeth; compound odontomes which are composed of all odontogenic tissues in an orderly pattern that results in numerous tooth-like structures but without morphologic resemblance to the normal teeth; and ameloblastic fibro-odontomes consisting of varying amounts of calcified dental and dental papilla-like tissues with the latter component resembling an ameloblastic fibroma. The ameloblastic fibro-odontomes are considered as an immature precursor of complex odontomes.[12] Compound odontomes are more common than complex odontomes with the most common location for complex odontomes being the posterior mandible as against the compound odontomes which are usually seen in the anterior maxilla.[2,8,9] The peak age of incidence is mostly in the second decade of life, however, few cases have been reported even in adulthood.[11] The common differential diagnoses include adenomatoid odontogenic tumor (AOT) and dentigerous cyst in addition to a plethora of the more commoner odontogenic tumors including unicystic ameloblastoma and ameloblastic odontoma and fibro-odontoma though with rare occurrence.[10] They can, also, appear as a part of syndromes such as Gardner's syndrome, basal cell nevus syndrome, familial colonic adenomatosis and Hermann's syndrome.[6,7,11] The present case report describes a similar case of multiple compound odontomes associated with an unerupted permanent maxillary central incisor. On the basis of radiographic features, a diagnosis of compound odontome was made and later, it was confirmed with histopathological examination. The treatment of choice for odontomes remains surgical excision, especially, when odontomes obstruct the eruption of the underlying permanent teeth to facilitate eruption. The prognosis is highly favorable and recurrence is rarely observed.

Conclusion: Occasionally, odontomes have been found to be associated with swelling and signs of secondary infection in addition to development of cystic lesions and subsequent cortical expansions and bone destructions. Early detection and treatment of odontomes could increase the possibility of preservation of the impacted teeth and preventing the developing malocclusion.

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Figures:

Figure 1

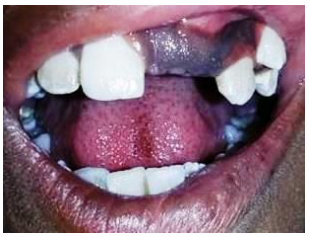


Figure 2

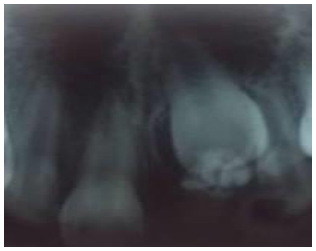


Figure 3

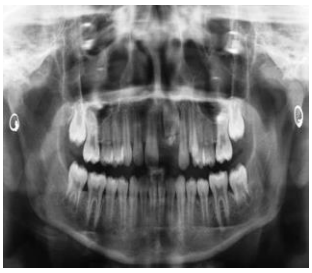
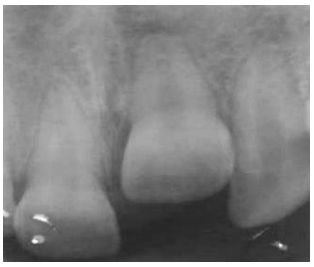


Figure 4



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Odontogenic Keratocyst: A Case Report

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Abstract: Cysts in jaws are very common due to the presence of odontogenic epithelial remnants in the jaws. The periapical cyst is the most common type of odontogenic cyst followed by dentigerous and odontogenic keratocysts (OKCs). OKCs most often occur in the second and third decades of life and show a slight predilection for males. OKC was first identified and described in the year 1876. In the year 1962, Pindborg and Hansen suggested histological criteria necessary to diagnose OKCs. In recent years, World Health Organization (WHO) has recommended the term cystic neoplasm (now, known as keratocystic odontogenic tumor (KCOT)) for this lesion as it has a characteristic, aggressive clinical behavior, high mitotic rate, histologically and has been reported to occur in association with genetic and chromosomal abnormalities. The present case report brings forth a similar case in a patient who underwent extraction of a tooth in the region of the cyst which was, however, not noticed by the operating surgeon. It was diagnosed subsequently in the Department of Oral Medicine and Radiology on the basis of its pathognomonic radiographic and histological features.

Key words: Odontogenic Keratocyst (OKC), keratocystic odontogenic tumor (KCOT), cystic neoplasm

Introduction: Kramer (1974) defined a cyst as a pathological cavity having fluid, semi-fluid or, gaseous contents and which is not created by the accumulation of pus.[1] Cysts in jaws are very common due to the presence of odontogenic epithelial remnants in the jaws. Cysts constitute about 17% of the total tissue specimens that are submitted to an oral pathology department for biopsy.[2] The periapical cyst is the most common type of odontogenic cyst followed by dentigerous and odontogenic keratocysts (OKCs).[3,4] OKCs most often occur in the second and third decades of life and show a slight predilection for males (male to female ratio being 1.3:1).[4] OKCs have attracted many researchers due to their unique characteristics. OKCs originate from the dental lamina remnants in the mandible and maxilla before odontogenesis is complete. They may, also, originate from the basal cells of the overlying epithelium. OKC was first identified and described in the year 1876. Further, it was taken-into

classification by Phillipsen in the year 1956. In the year 1962, Pindborg and Hansen suggested histological criteria necessary to diagnose OKCs. In recent years, World Health Organization (WHO) has recommended the term cystic neoplasm (now, known as keratocystic odontogenic tumor (KCOT)) for this lesion as it has a characteristic, aggressive clinical behavior, high mitotic rate, histologically and has been reported to occur in association with genetic and chromosomal abnormalities.[5] Clinically, OKCs are not associated with symptoms and most of the cysts reach a large size when compared to other jaw cysts at the time they reveal symptoms of low to moderate grades of swellings/jaw expansions and/or, other features of inflammation if they get secondarily infected. It is of interest to note that these cysts more often penetrate the bone rather than expand.[6] The present case report brings forth a similar case in a patient who underwent extraction of a tooth in the region of the cyst which was, however, not noticed by the operating surgeon. It was diagnosed subsequently in the Department of Oral Medicine and Radiology on the basis of its pathognomonic radiographic and histological features.

Case report: A 40 year old male patient reported with the chief complaint of pus discharge from lower right back region of jaw since last 8-10 days. On enquiring, the problem initially presented as pain in lower right back tooth region 2 months before for which he had consulted a dental surgeon and was advised extraction of 46.The extraction was done without any radiographic investigation as reported by the patient. His past medical history and general examination were unremarkable. On clinical examination, no specific extra-oral findings were observed. (Fig.1) On intra-oral examination, 46 was missing. (Fig.2) There was mild tenderness on palpation and pus discharge was observed through unhealed extraction socket in relation to 46. There was no evidence of vestibular obliteration or, expansion. On intra-oral periapical radiographic examination, a diffuse radiolucency was observed in relation to 45,46,47 region extending anteriorly from the inter-dental region in between 44,45 to posteriorly up to 47. Superiorly, the extent of the lesion was till the alveolar ridge while the inferior extent of the lesion could not well be appreciated since it extended till the inferior border of the image. (Fig.3) To study the complete extent of the lesion, an orthopantomograph (OPG) was advised which revealed a well-defined unilocular radiolucenct lesion in relation to 45,46,47 region, oval in shape and well-corticated, extending anteriorly from the inter-dental region in between 44,45 to posteriorly up to 47. Superiorly, the extent of the lesion was till the alveolar ridge to inferiorly 2cm above the inferior border of mandible. (Fig.4) Mandibular cross-sectional occlusal radiograph revealed a well-defined oval radiolucency in relation to missing 46. (Fig.5) On the basis of the radiographic findings, a radiographic diagnosis of odontogenic keratocyst was made while the differentials included residual cyst, simple bone cyst and unicystic ameloblastoma. An informed consent was taken and the patient was advised routine blood investigations. Under local anesthesia, access opening of 45 and 47 was done and a window was created on buccal cortical plate and marsupialization was done. (Fig.s.6,7) The excised specimen was submitted for histopathological interpretation. (Fig.8) Histopathological report revealed cystic lumen lined by

stratified squamous parakeratinised cystic epithelium overlying the fibrous capsule. The lining epithelium was 6-10 layer thick with palisading of the basal cells and corrugated superficial surface. The epithelial-connective tissue interface was flat. (Fig.s.9,10) The overall features were suggestive of odontogenic keratocyst in accordance with the radiographic diagnosis. On the basis of clinical, radiographic and histopathological examination, a final diagnosis of odontogenic keratocyst was made. The patient was recalled after a week and was advised post-operative orthopantomograph (OPG). (Fig.11) The patient was observed and kept on long-term follow-up for an eventual enucleation of the cyst with apicoectomy of the teeth which were treated endodontically.

Discussion: There has been a great deal of interest in odontogenic keratocyst (OKC) since it became apparent that it might grow to a large size before it manifests clinically and that unlike other jaw cysts, it has a particular tendency to recur following surgical treatment.[1] The odontogenic keratocyst is a histopathologically and behaviorally unique clinical entity. It is the most aggressive and recurrent of all the odontogenic cysts and shows characteristics resembling both of a cyst and a benign tumor.[7] Early diagnosis of this lesion is not easy as OKCs involve the cancellous bone and tend to enlarge it to considerable size before any significant buccal or, lingual cortical plate expansion appears. The term OKC was subsequently replaced in the 2005 edition of the World Health Organization Classification of the Head and Neck Tumors by the term Keratocystic Odontogenic Tumor (KCOT). The World Health Organization working group believed that this new term truly reflected the neoplastic nature of this lesion. This re-classification was determined by the clinical features of this cystic entity including its potential for locally destructive behavior, high recurrence rate and a tendency for multiplicity.[7,8] Most of lesions (60%) arise from the rests of dental lamina or, from the basal cells of oral epithelium and are, thus, of primordial-origin odontogenic keratocysts while the remaining 40% of the cystic lesions arise from the reduced enamel epithelium of the dental follicle and are, thus, dentigerous-origin odontogenic keratocysts.[7] OKCs may occur at virtually any age, however, the highest peak of incidence is generally seen in the second and third decades of life. Several authors have, also, noted a second peak of incidence between the fifth and eighth decades of life. The sex distribution may be equal or, there might be slight male preponderance.[9] OKCs may occur in any part of the upper and lower jaws with the majority of the lesions occurring in the mandible, most commonly, in the angle and ramus regions of the mandible. The present case report, also, describes the occurrence of OKC in a patient who was a middle aged male with the lesion in posterior mandibular region. OKC is an important part in the clinical features of basal cell nevus or, Gorlin-Goltz syndrome. Mutation of the PTCH gene is partly responsible with partial expression of the mutated gene held responsible for the origin of the appearance of multiple and recurrent keratocystic lesions. The basal cell nevus syndrome (also, called Gorlin syndrome or, Gorlin-Goltz syndrome) is a genetic condition with an autosomal-dominant inheritance pattern that includes a triad of multiple KCOTs of the jaws, other skeletal abnormalities (often including bifid ribs, abnormalities in the length of the fingers and toes, frontal

bossing and calcification of the falx cerebri) as well as cutaneous manifestations such as basal cell carcinomas, palmar pitting of the hands and various other skin abnormalities.[9] Most keratocysts are asymptomatic. Inflammation, pain, discomfort or, a swelling are the usual complaints when the cyst gets secondarily infected. Most often, the lesion is incidentally diagnosed on a routine radiographic examination.

Radiographically, OKCs might be seen as unilocular or, multilocular, oval or, round radiolucent lesions with relatively smooth or, well-defined corticated borders. The internal structure is radiolucent, however, few cases present with internal septa giving the lesion a multilocular appearance. An important characteristic of OKCs is they expand along the internal aspect of the body of the jaw bones causing minimal expansion of the cortical plates.[10] One of the characteristic features of OKCs is their relatively high recurrence rate. The relatively high recurrence rates of OKCs are attributed to an increased activity of their epithelial lining and observed separation of the epithelium from the underlying connective tissue at the time of cyst enucleation. It is, also, hypothesized that the enzymatic activity within the cyst might be responsible for the observed epithelial separation. Brannon RB, in his review of 312 OKCs, suggested three mechanisms responsible for the high recurrence rates seen in OKCs including the persistence of the remnants of dental lamina within the jaw bones which are not associated with the primary lesions of OKC, incomplete removal of the original cystic lining and cortical perforation with adherence to the adjacent soft tissues and cell rests of dental lamina and satellite cysts that remain behind even after a meticulous enucleation procedure.[11] The histopathological findings of OKCs are highly specific and include a uniform cystic lining, hyperchromatic and palisaded basal cells, wavy parakeratin production and a flat interface between the epithelium and connective tissue wall.[12] The treatment of OKCs requires more critical evaluation and a proper treatment plan due to their higher rate of recurrence. There are various treatment modalities available depending upon the size, site and the extent of the lesion including the more common marsupialization procedures in addition to surgical decompression and an eventual enucleation with or, without adjuncts. Decompression of a cyst involves any technique that relieves pressure within the cystic lumen by making a small opening into the cyst and keeping it open with a drain. Marsupialization, on the other hand, involves converting the cyst into a pouch so that the cyst is decompressed but this is a more definitive treatment than decompression as it exposes the cyst lining to the oral environment.[13,14] Decompression or, marsupialization have been recommended in a number of studies as procedures that allow partial decrease in the size in OKCs, so that, vital structures like the inferior alveolar nerve could be preserved at the time of complete enucleation of the said cysts.[15] Studies have, also, revealed that when OKCs are opened into the oral cavity by marsupialization, a number of changes occur in the cyst lining. Histologically, the lining of OKCs is only 6-10 layer thick and tears easily on attempted enucleation which is one of the causes of the high recurrence rates seen. With decompression or, marsupialization, the lining appears to become thicker and easier to enucleate that can be planned at a later stage and histologically, it does appear to change and resemble normal oral mucosa both with routine histology and with

immunohistochemistry.[16] Enucleation is another form of cyst treatment. Given the recurrence rate to be as high as 62.5%, simple enucleation is no longer acceptable. Curettage and enucleation are considered by many as the minimal requirement therapeutically. Therefore, in order to make the treatment more effective, Stoelinga PJ advocated excising the overlying oral mucosa in continuity with the cystic lesion.[17,18] Post-operative follow-ups with radiological examinations are, also, highly recommended for at least five years following the surgical procedures in order to rule-out any possibility of recurrences.

Conclusion: In India, it is a common practice among dental practitioners to perform extractions without pre-operative radiographs because it can most often be done without any complication. The present case report, on the contrary, overcomes this belief and highlights the clinical significance of routine radiographic examinations before any extractions and/or, minor surgical procedures are carried-out for a more complete and comprehensive dental care.

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Figures:

Figure 1

Figure 2

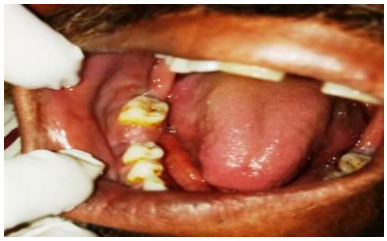
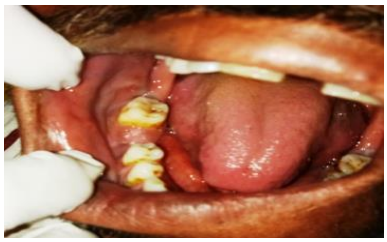


Figure 3



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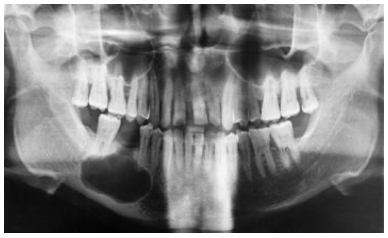

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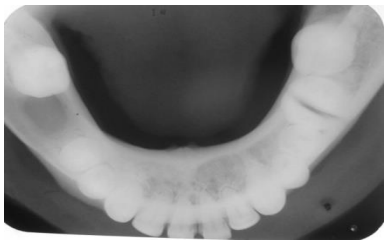

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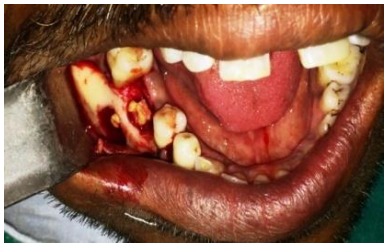

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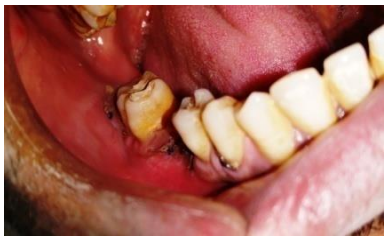

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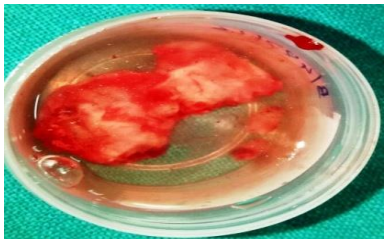

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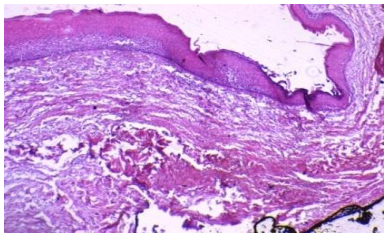

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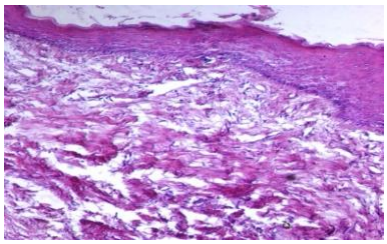

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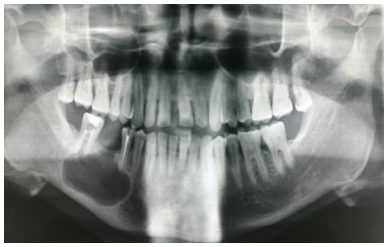

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Versatility of 3D Plating System for Osteo-Synthesis of Mandibular Fractures: Case Series

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Abstract: The concept of three-dimensional (3D) plating system is a geometrically-closed quadrangular plating system secured with bone screws that creates stability in three dimensions. The aim of the present case series was to compare the efficacy of 3D stainless steel and titanium mini-plates and screws for fixation of the Mandibular fractures.

Key words: 3D Plating, Osteo-Synthesis, Mandibular Fractures

Introduction: Urbanization and increasing use of high speed automobiles are responsible for the majority of road traffic accidents (RTAs) which has made the incidence of traumatic injuries to the maxillofacial skeleton increasingly alarming. Cosmetic and functional disability brings morbidity to the trauma patient and is of primary concern. The aim of a maxillofacial surgeon is restoration of the form and function of maxillofacial skeleton to normal or, at least near normal. Maxilla and mandible are the keystones to the bony architecture of the face and the presence of teeth in the maxillofacial region makes the management of maxillofacial trauma unique as compared to long bones. The history of treatment of facial bone fractures parallels the development of modern oral and maxillofacial surgery. If put on the time line, the management of trauma has evolved greatly over the years from supportive bandages, splints , circum-mandibular wiring , extra-oral pins to rigid fixation and more lately, semi-rigid fixation.[1-6] After the second world war, the treatment modality has positively changed from closed to open reduction and direct fixation using bone plates and screws.[7] Rigid fixation could be with or, without dynamic compression but fixation with these compression plates has many

disadvantages.[8-10] However, since the work of Champy M et al[5] and later, Michelet FX et al[11], mini-plate osteo-synthesis has become an important fixation method in maxillofacial and craniofacial surgeries. Semi-rigid fixation creates doubt whether a single mini-plate fixation is sufficiently stable for fractures that cannot be adequately reduced.[12] These shortcomings led to the development of three dimensional (3D) mini-plates by Farmand M[13]. The fundamental idea of three dimensional (3D) mini-plates is based on the principle of a quadrangle as a geometrically stable configuration for support. Increased stability is achieved by the geometric shape of the quadrangular plate rather than by its thickness or, length.[13-15] The requirements of an ideal implant material used for osteo-synthesis include biocompatibility and ease of adaptation in addition to the required stabilization of the fractured segments without impairment of the blood supply.[16] The aim of the present case series was to compare the efficacy of 3D stainless steel and titanium mini-plates and screws for fixation of the mandibular fractures.

Case Series:

Case Report 1: A 28 years old male patient reported to the Department of Oral and Maxillofacial Surgery with a complaint of severe pain and limited mouth opening in the setting of history of an RTA. On gross examination, typical clinical signs and symptoms of mandibular parasymphyseal fracture were noted. (Fig.1) The orthopantomograph (OPG) of the patient revealed a fracture line in the left parasymphyseal region. The fracture appeared vertical, non-communicated and without dislocation of the fractured fragments. The fracture was treated with open reduction and internal fixation with 3D stainless steel mini-plates and screws. (Fig.s.2,3)

Case Report 2: A 39 years old male patient reported to the Department of Oral and Maxillofacial Surgery with a complaint of pain and a history of assault. Examination of the patient revealed typical clinical signs and symptoms of mandibular parasymphyseal fracture. (Fig.4) Orthopantomograph (OPG) revealed fracture line in the right parasymphyseal region. The fracture line was oblique, non-communicated and without dislocation of the fractured fragments. (Fig.5: cropped panoramic image) The fracture was treated with open reduction and internal fixation with 3D titanium mini-plates and screws. (Fig.s.6,7)

Discussion: The use of 3D plates in mandibular fractures is not as yet popularized. In a published survey of 104 North American and European surgeons, only 6 % stated that they used these types of plates.[17] These plates have been quoted by many names in the English literature i.e. 3D plates, matrix plates and strut plates. Furthermore, 3D titanium plates have been used sporadically by few surgeons predominantly for fixation of the mandibular angle region.[13,15] Hughes PJ[18] extended their use to the anterior mandible. Their use in the maxilla has yet remained skeptical with Farmand M[13] being the only surgeon to have used them for the maxillary fracture osteo-synthesis. Thereby, the present cases, also, intended to use 3D plates for fixation in the mandible. Guimond C[19] found the fixation with 3D plates predictable with the plates being strong

and still malleable facilitating stabilization at both the superior as well as the inferior borders. Also, 3D titanium plates have been found to be easy to use as an alternative to conventional mini-plates, however, contraindicated in fractures with lesser inter-fragmentary bone contact. There have been numerous reports suggesting the successful clinical outcome of 3D titanium plates in the treatment of mandibular fractures.[20,21] Stainless steel plates are, however, more popular and more cost-effective than the titanium plates, although, there are no documented studies conducted so far evaluating the effectiveness of stainless steel 3D plating systems.[22] The present case series, therefore, attempted to compare the effectiveness of 3D stainless steel and titanium mini-plates and screws for fixation of the mandibular fractures. Wittenberg JM et al[14] in his biomechanical experiment concluded that the entire 3D titanium plate was formed by joining two mini-plates with interconnecting vertical cross-bars which reinforced each other, thereby, making the plate acting as a single unit. Interconnections of the plate reduced the vertical displacement and shearing of the bone to minimal. Feledy J[23] compared the 3D titanium matrix plates with paired mini-plates in a biomechanical experiment and found better bending stability and more resistance to out of plane movements. The clinical effectiveness of 3D plating system, before it is put to extensive clinical usage, however, needs to be further verified and substantiated by biomechanical studies. Both the titanium and stainless steel 3D plates offer an advantage of reduced operative time. The 3D plates are easy to place at various fracture sites in the mandible, however, at the curved bony contours of the parasymphyseal region, the stainless steel plates encounter difficulty in adaptation. The present case series concludes with recommendation for usage of 3D plates for use at various sites of the mandibular fractures and in particular, titanium plates for the treatment of fractures in the parasymphyseal region because of their excellent adaptability. Furthermore, both titanium and stainless steel 3D plates were found to be equally successful in providing satisfactory osteo-synthesis of mandibular fractures although stainless steel plates had a definite advantage of cost-effectiveness.

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Figures:

Figure 1

Figure 2

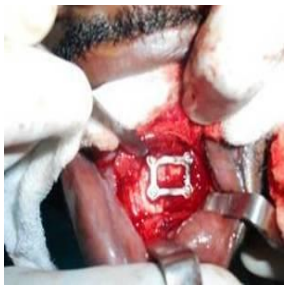


Figure 3

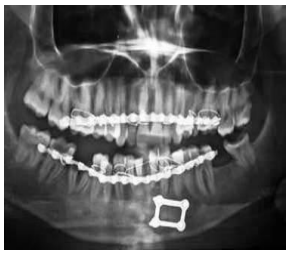


Figure 4

Figure 5

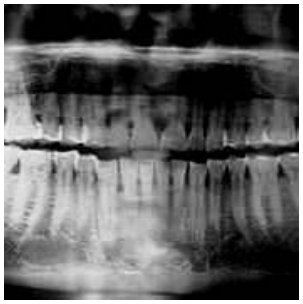


Figure 6

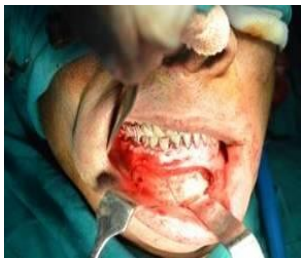
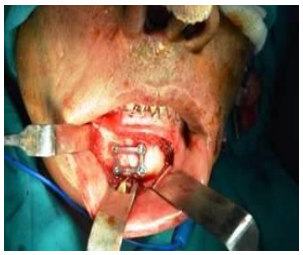


Figure 7



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