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## Executive Editorial

It is a matter of immense pleasure for me to bring the current issue of our Institutional Journal with a plethora of sensible manuscripts which we are getting to be published in the perspective of contemporary era with sheer competition of the vast knowledge that is increasing with each passing day in the profession.

As I have always maintained, I expect the readers will be benefitted intellectually with the manuscripts selected for the current issue. It is indeed very satisfying to get manuscripts from the colleges countrywide which is an indirect indication that the journal is getting its due impact and place in the world of academics. Mistakes might have crept in despite stringent precautions that we have taken in the bringing of this issue. I request support of all readers and invite suggestions in improving the journal so that our dream of getting unmatched in the intellectual world is met with shortly.

With best regards,

**Dr. Abhishek Singh Nayyar**

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# Pyogenic Granuloma : A Case Report

Dr. Ujjwala Makne<sup>a</sup>, Dr. Sandeep Patel<sup>b</sup>, Dr. Vaibhav Joshi<sup>c</sup>, Dr. Motilal Jangid<sup>d</sup>, Dr. Sandhya Rathod<sup>e</sup>, Dr. Sachin Deshmukh<sup>f</sup>

**Abstract:** Pyogenic granuloma (PG), also known as a “Granuloma gravidarum,” is primarily a lesion which appears, usually, in relation to the attached gingiva, as an overgrowth of the gingival tissue due to irritation, physical trauma or hormonal factors. Pyogenic granuloma is an inflammatory hyperplasia affecting the oral tissues. It is a tumour-like growth of the oral cavity which usually arises in response to non-specific infections and irritations. Because of the high frequency of pyogenic granuloma in the oral cavity, this case report describes a pyogenic granuloma in a 55-year old female patient, discussing its clinical and histopathological features that distinguish this lesion from other similarly looking oral mucosal lesions and also, the successful management of it.

**Key words:** pyogenic granuloma, hyperplasia, gingival tissues, trauma

**Introduction:** Pyogenic granuloma (PG) is a kind of inflammatory hyperplasia found in oral cavity which is considered to be non-neoplastic in nature.<sup>1</sup> Hullihen was the first to describe a case of pyogenic granuloma in English literature. In 1904, Hartzell gave the current term of “Pyogenic granuloma” or “Granuloma pyogenicum”.<sup>2</sup> The synonyms used for the same lesion are “Eruptive hemangioma”, “Granulation tissue-type hemangioma”, “Granuloma gravidarum”, “Lobular capillary hemangioma”, “Pregnancy tumor” and “Tumor of pregnancy”. Cawson et al in dermatologic literature have described it as “Granuloma telangiectacticum” due to the presence of numerous blood vessels seen in its histological sections.<sup>3</sup> The name for pyogenic granuloma is misleading because it is not a true granuloma. In actuality, it is a capillary hemangioma of lobular sub-type which is the reason they are often quite prone to bleeding. It is a hyperactive benign inflammatory lesion commonly seen in the oral cavity with gingival tissues being the most commonly affected site followed by buccal mucosa, tongue and lips. Pyogenic granuloma (PG) may occur in all age groups, though it is predominantly seen in young females in the second decade of life because of the hormonal changes in this period.<sup>4</sup> In majority of the cases, minor trauma or irritation are cited in the etio-pathogenesis of pyogenic granuloma.<sup>5</sup> Infection may play a role with suggestions of agents such as streptococci and staphylococci.<sup>6</sup> Recently,

angiopoietin and ephrin B2 found in other vascular tumors such as Bartonella Hanselae, B Quintana and human herpes virus 8, have been postulated to play a role in leading to the recurrence of PG.<sup>7</sup> Viral oncogenes, hormonal influences, microscopic arterio-venous malformation along with inclusion bodies and gene depression in fibroblasts, have been implicated in the etio-pathogenesis of PG.<sup>8</sup> Clinically, these lesions usually present as single nodules or sessile papules with smooth or lobulated surface and maybe seen in any size from a few millimetres to several centimetres. As the lesion matures, the clinical appearance is more collagenous and pink due to decrease in vascularity of the lesion. It preferentially affects the gingiva but may also occur on the lips, tongue, oral mucosa and palate. This article reports the case of a 55-year-old female patient with pyogenic granuloma successfully managed by surgical intervention.

**Case Report:** A 55-year old female patient reported to the Department of Periodontics and Oral Implantology with the complaint of a growth in the lower right back tooth region since 3 months. The growth was small in size initially and slowly attained the present size. Patient reported discomfort associated with the growth which increased on chewing food. Medical history was non-contributory. Intra-oral examination revealed a solitary, round, red exophytic, pedunculated growth, measuring about 2.0 x 2.0cm, present in

relation to the gingiva extending from mesial aspect of 43 to the mesial aspect of 46 (Fig.1). On palpation, all inspectory findings were confirmed. The growth was non-tender on palpation with absence of pus discharge. Bleeding on provocation was positive. Oral hygiene was poor with abundance of calculus and stains. Complete hemogram showed all blood counts to be within normal limits. Intra-oral periapical radiograph (IOPAR) revealed no bone involvement in the affected region (Fig.2). Oral prophylaxis was performed. In addition, chemical plaque control measures were advised in the form of 0.2% chlorhexidine gluconate mouthrinse. Excisional biopsy was planned and informed consent was taken. Oral prophylaxis was completed and the patient was called after a week for excision of the lesion. The patient was re-evaluated after a week where lesion looked less inflammatory and pink as compared to the presentation at 1st visit (Fig.3). The lesion was excised under aseptic conditions. Excision of the lesion upto and including the muco-periosteum was carried-out under local anesthesia using a scalpel and blade followed by curettage and a thorough scaling of the involved teeth was performed (Fig.4). Periodontal dressing was placed and post-operative instructions with antibiotics and analgesics were given (Fig.5). The excised tissue was sent for histopathological examination (Fig.6). The patient was re-called after 1 week for removal of the pack and follow-up (Fig.7). Histopathological examination showed a hyperplastic, parakeratinized stratified squamous epithelium with a loose connective tissue that was highly vascular with budding endothelial capillaries and dense chronic inflammatory cell infiltrate. The connective tissue also revealed proliferating fibroblasts and collagen fibres interposed in which patchy distribution of lymphocytes and plasma cells was seen (Fig.8). Also, there was no evidence of atypia or malignancy. The clinical and histopathological findings confirmed it to be a case of pyogenic granuloma.

**Discussion:** Pyogenic granuloma is a kind of inflammatory hyperplasia. The term inflammatory hyperplasia is used to describe a large range of

nodular growths of the oral mucosa that histologically represent inflamed fibrous and granulation tissue.<sup>9,10</sup> The pyogenic granuloma is a relatively common, tumor like, exuberant tissue response to localized irritation or trauma. Oral pyogenic granuloma show prominent capillary growth within a granulomatous mass rather than the real pyogenic organisms and pus, so the term pyogenic granuloma is a misnomer and it is not a granuloma in the real sense.<sup>11</sup> Pyogenic granulomas occur in all age groups but are more frequently encountered in females in their second decade of life due to the increased levels of circulating hormones estrogen and progesterone. In contrast, Epivatianos et al reported that the average patient age was 52 years with a peak incidence of occurrence in the sixth decade of life.<sup>12</sup> In the present case, the patient was 55 years old. Yuan et al concluded that the morphogenetic factors were higher in pyogenic granuloma rather than the normal gingiva supporting the mechanism of angiogenesis in oral pyogenic granulomas in pregnant females.<sup>13</sup> However, the effect of female hormones on oral pyogenic granulomas was questioned by Bhaskar et al since they found lesions both in males and females with no specific sex predilection.<sup>14</sup> The pyogenic granuloma most frequently develops on the buccal gingiva in the interproximal tissues between the teeth. Three quarters of all oral pyogenic granulomas occur on the gingiva with the lips, tongue (especially the dorsal aspect) and buccal mucosa being the most commonly affected areas.<sup>15</sup> According to Vilmann et al, majority of the oral pyogenic granulomas are found on the marginal gingiva with only 15% in relation to the alveolar part.<sup>8</sup> In our case, also, the lesion presented mainly in relation to the marginal gingiva on lingual side. The etiology of PG is largely unknown with irritation from local factors and otherwise, being only the major contributory factors towards their development. It was believed to be a botryo-mycotic infection but later, suggested to be caused by infection by streptococci and staphylococci. Now, it is believed that low grade trauma or irritation, hormonal influences, viral

oncogenes, or certain kinds of drugs, are the main causative factors. A history of trauma is common in extra-gingival sites whereas most lesions of the gingiva are a response to irritation. Because of this irritation, the underlying fibro-vascular connective tissues become hyperplastic and there is proliferation of granulation tissue which leads to the formation of a pyogenic granuloma.<sup>16</sup> In the present case, patient's oral hygiene was poor. Chronic irritation resulting from accumulated plaque and calculus could have contributed to the development of PG. The size varies in diameter from a few millimetres to several centimetres. Rarely does a pyogenic granuloma exceed 2.5cm in size and usually reaches its full size within weeks or months. Young pyogenic granulomas are highly vascular in appearance because they are composed predominantly of hyperplastic granulation tissue in which capillaries are prominent. The older lesions, on the other hand, tend to become more collagenized and pinkish in color. Involvement of bone in pyogenic granuloma is rare.<sup>17</sup> In our case, too, intra-oral periapical radiograph revealed no bony involvement. Peripheral giant cell granuloma, irritational fibroma, lymphoma, capillary hemangiomas and metastatic tumour are the major differential diagnoses to be considered in case of a PG. Hence, biopsy findings are important in establishing diagnosis. The clinical and histopathological findings led to a final diagnosis of PG in our case. Treatment of PG involves a complete surgical excision. After excision, a recurrence rate of upto 16% has been reported.<sup>18</sup> Recurrence is believed to result from incomplete excision, failure to remove etiologic factors, or re-injury of the area. Hence, the patient was advised for regular maintenance visits. Although pyogenic granuloma is a non-specific growth in the oral cavity, proper diagnosis, prevention, management and treatment of the lesion are very important. Pyogenic granuloma arises in response to various stimuli such as low grade local irritation, sex hormones, traumatic injury and/or certain kind of drugs. As, in this patient, as she had abundant local deposits, removal of

causative irritants was the major line of treatment. Excision was the treatment of choice.

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**Figures:**

Fig.1:



Fig.2:

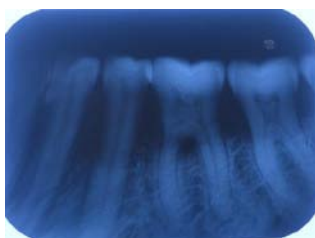


Fig.3:



Fig.4:



Fig.5:



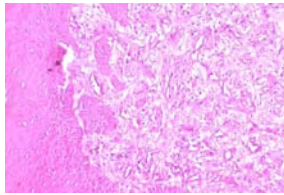
Fig.6:



Fig.7:



Fig.8:



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## Oral Mucocele : A Case Report

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**Abstract:** The mucocele or mucus retention phenomenon, as it is called, is a salivary gland lesion of traumatic origin which is formed when the main duct of a minor salivary gland is torn with subsequent extravasation of the mucus into the adjacent fibrous connective tissue, so, that a cyst-like cavity is produced and it is filled with mucin. This paper gives an insight into the phenomenon based on a case report that is being presented herewith. A patient aged 23 years reported to the Department of Periodontics and Oral Implantology with the chief complaint of a small swelling on the right side of the lower lip since two months. The swelling was diagnosed as an extravasation mucocele after taking history and a thorough clinical examination. The treatment involved surgical excision of the tissue, its histopathological examination and regular follow-up to check for an uneventful healing.

**Key words:** mucocele, marsupialization, surgical excision

**Introduction:** Mucocele is a common lesion of the oral mucosa that results from an alteration of minor salivary glands due to mucous accumulation. Mucoceles involve mucin accumulation causing limited swelling.<sup>1</sup> Mucoceles can appear by an extravasation or retention phenomenon. There are two crucial etiological factors in the occurrence of mucoceles: chronic trauma and/or obstruction of salivary gland ducts.<sup>2</sup> Extravasation mucoceles result from ruptured salivary gland ducts and the consequent, spillage of mucin into the adjacent soft tissues around the gland. This type of mucoceles is commonly found in association with minor salivary glands. Bagán et al stated that 5% of the mucoceles were actually retention mucoceles while the remaining 95% were extravasation mucoceles.<sup>1</sup> Extravasation mucoceles undergo three evolutionary phases. In the first phase, mucous spills from the excretory duct into the adjacent connective tissues where some leucocytes and histiocytes appear. In the 2nd stage, granulomas appear during the resorption phase due to histocytes, macrophages and multinucleated giant cells associated with a foreign body reaction. In the final phase, connective tissue cells form a pseudo-capsule without epithelium around the mucosa. Retention mucoceles appear due to a decrease or absence of the glandular secretion produced by blockage of the salivary gland ducts.<sup>3</sup> When located in the floor of

the mouth, these lesions are called ranulas because the inflammation resembles the cheeks of a frog.<sup>4</sup> Retention mucoceles are formed by dilation of the duct secondary to its obstruction or caused by a sialolith or dense mucosa. The majority of retention mucoceles develop in the ducts of the major salivary glands.<sup>4</sup>

**Case Report:** A 23 year old male patient reported to the Department of Periodontics and Oral Implantology with a chief complaint of swelling on the right side of lower lip. The history of present illness consisted of the swelling in the lower lip since 2 months in the inner aspect of the lower lip. A detailed history elicited from the patient revealed the etiology to be in the lip biting habit. The examination of the swelling showed it to be oval in shape, soft and fluctuant on palpation with no surface rise in temperature. It was bluish in color and asymptomatic. The swelling was 1.5 cm in diameter and superficially placed in the inner aspect of the labial mucosa of the lower lip (Fig.1). The patient did not have any difficulty in speaking or chewing. All permanent teeth (except, third molars) were present. Generalized superficial stains were present. All the teeth were properly aligned in the arch and no other mucosal lesions were present on the oral mucosa. Based on the above findings, a provisional diagnosis of an extravasation mucocele

was arrived-at. The list of differential diagnoses included retention mucocele which although is more commonly seen in association with major salivary glands and is atraumatic in origin while extravasation mucoceles are commonly found in relation to the lower lip and are traumatic; and hemangioma and lipoma wherein an FNAB (fine needle aspiration biopsy) was performed to rule-out them. In our case, FNAB showed the presence of clear mucinous fluid. The prescribed investigations before the surgical excision of the lesion included 1.FNAB; 2.Routine blood investigations that were conducted and the values were found to be in the normal limits with Hb, 13gm%, a bleeding time (BT) of 2min., clotting time (CT) of 6min. and a total leucocyte count (TLC) of 7200. Oral prophylaxis was performed on the first visit and oral hygiene instructions were given. Cast model of the teeth were poured to check for occlusal discrepancies or pre-mature contacts. Surgical removal of the lesion was planned. The procedure was done under inferior alveolar nerve block and mandibular local infiltration to block cross innervations from the opposite side. A plus-shaped incision was placed on the most dependent part of the lesion. Flap was reflected cautiously and the lesion was excised completely as a cyst (Fig.2). Complete removal of the lesion was done along with proper curettage to remove the blocked part of the minor salivary gland duct (Fig.3).The flap was approximated and sutured (Fig.4).The excised tissue was sent for histopathological analysis. The patient was advised not to tamper with the sutures and was prescribed analgesics for pain relief. The patient was re-called after one week for the removal of sutures.

**Discussion:** Mucocele, as a lesion, shows propensity in the second decade of life with incidence being rare below one year of age.<sup>2</sup> Various studies have not indicated towards a specific gender predilection.<sup>2,5</sup> The diagnosis is largely clinical with a histopathological examination of the aspirant ruling-out chances of hemangioma and other lesions in the differentials including lipoma. The retention mucoceles show true cystic characteristics with the presence of an epithelial lining and absence of any

inflammatory reaction. Extravasation mucoceles are also called as pseudo cysts with an incomplete epithelial covering surrounded by inflammatory elements and granulation tissue.<sup>1</sup> It is important in the case of the retention type of mucoceles to surgically excise the lesion with its epithelial lining to ensure complete removal and chances of recurrence. A simple drainage with a surgical incision has shown recurrence as soon as the wound heals.<sup>6</sup> Some authors have also suggested cryosurgery<sup>7</sup> and intra-lesional steroid injections<sup>8</sup> in addition to CO2 lasers<sup>6</sup> as alternative treatment modalities to overcome the complications seen in the surgical excision of the lesions including temporary paresthesia, fibrous scar formation and most importantly, recurrence of the lesions due to further trauma to the adjacent minor salivary gland tissues and ducts during the surgical procedure. Larger mucoceles can be treated by marsupialization which involves surgical removal of the cystic contents by de-roofing the cystic cavity and suturing of the cystic lining to the surrounding tissue preventing the chances of recurrence.<sup>7</sup> A habit breaking appliance (lip bumper) was provided to the patient to discourage the patient from lip biting and repeatedly, traumatizing the soft tissues, increasing the chances of the recurrence of the treated and appearance of the new lesions. In the present case, we did not observe any kind of malocclusion which implied that the lip sucking habit was from a shorter duration. The surgical wound helped in the initial cessation of the habit and later, it was completely regressed with the help of lip bumper given for a period of 3 months. The treatment of lesions such as mucoceles must be planned taking into consideration the various clinical parameters and any oral habits that might have a probable role in the etiology of these lesions with a high propensity of recurrence.

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#### Figures:

Fig.1:

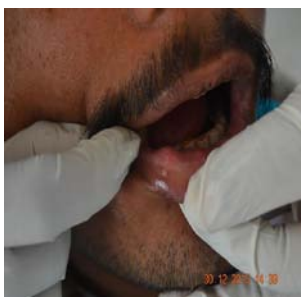


Fig.2:



Fig.3:



Fig.4:



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# Giant Cells : A Review

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**Abstract:** Giant cells are large mononucleated or multinucleated cells that are seen in a variety of physiological as well as pathological conditions. The commonly encountered giant cells arise from the monocyte precursors formed by different mechanisms. Multinucleated giant cells (MGCs) are important mediators of tissue remodeling and repair and also, for removal of foreign materials and various pathogens.

**Key words:** osteoclasts, odontoclasts, foreign body giant cells, Langhans giant cells

**Introduction:** A multinucleated giant cell is a cell that is larger in dimension than the cells that are routinely encountered in histology with varying number of nuclei. These cells are involved in numerous physiological and pathological processes. The giant cells may be mononucleated or multinucleated which can be explained by the mechanism of their formation. A multinucleated giant cell (MGC) is a cell that is formed by the union of several distinct cells. They are usually of monocyte or macrophage lineage.<sup>1</sup> Giant cells are broadly classified as:

Physiological giant cells:<sup>2</sup>

1. Osteoclasts;
2. Odontoclasts;
3. Megakaryocytes; and
4. Trophoblasts/Syncytiotrophoblasts.

Pathological giant cells:<sup>2</sup>

1. Foreign body giant cells;
2. Langhans giant cells;
3. Touton giant cells;
4. Aschoff giant cells;
5. Dorothy Reed giant cells/Reed Sternberg giant cells;
6. Tumor Associated Giant cells;
7. Warthins Finkeldys giant cells; and
8. Tzank cells.

**Osteoclasts:** Osteoclasts, as named by Kolliker, are bone resorbing cells that play an important role in bone homeostasis and remodeling. Osteoclast precursors are derived from bone marrow as early mononuclear macrophages which circulate in blood and bind to the surface of bone.<sup>1</sup> Morphologically, osteoclasts are similar to foreign body giant cells although they have considerably fewer nuclei,

usually 10 to 20 nuclei per cell, and are found on bone surfaces (Fig.1). They are also found on the endosteal surfaces within the Haversian System and on the periosteal surface beneath the periosteum.<sup>3</sup> **Odontoclasts:** Odontoclasts are readily identifiable in the light microscope as large, multinucleated cells, occupying resorption bays on the surface of a dental hard tissue. Odontoclasts are identical to osteoclasts. These are the cells responsible for the resorption of dental hard tissues (Fig.2). They are smaller than osteoclasts, contain fewer nuclei, vacuolated cytoplasm and produce smaller resorption lacunae.<sup>4,5</sup> The surface of the cells adjacent to the resorbing hard tissues form a characteristic "ruffled" border. The odontoclasts fuse with each other to form a multinucleated giant cell only after they get attached to the resorbing surface (Fig.2). Odontoclasts probably have the same origin as osteoclasts.<sup>4,5</sup>

**Megakaryocytes:** Megakaryocytes are found in alveolar capillaries, from time to time, in normal and pathological tissues and have no special significance. These cells are always intra-vascular. The nuclei are large, lobulated and stain deep blue with hematoxylin (Fig.3).<sup>6</sup>

**Trophoblasts/Syncytiotrophoblasts:** The cells in placenta (cyto-trophoblasts) fuse together as one continuous mass of multinucleated cytoplasm derived from trophoblasts. They help in attachment of the embryo to the endometrium. They form the outermost fetal component of the placenta and increase the surface area for nutrient exchange between the mother and fetus (Fig.4). These cells also secrete progesterone and human chorionic gonadotrophin (HCG).<sup>6</sup>

**Foreign Body Giant Cells:** Foreign body giant cells (FBGCs) are larger than Langhans giant cells with nuclei (upto 100-200) randomly scattered throughout their cytoplasm (Fig.5). FBGCs most commonly are observed in foreign body granulomas formed in response to the various exogenous or endogenous foreign bodies. It was suggested that these cells are formed from the fusion of macrophages.<sup>1</sup> The current concepts of foreign body giant cell formation include two different views. According to first view, simple cells undergo amitotic division and form a multinucleated giant cell, the other view, suggests that a fusion of mononuclear cells forms a multinucleated giant cell.<sup>2-7</sup>

**Langhans Giant Cells:** The presence of MGCs in tuberculous granuloma was first described by Langhans in 1868. They are commonly found in immune-mediated granulomas and granulomatous inflammations in the presence of indigestible particles of organisms, eg: the tubercle bacilli.<sup>1</sup> Langhans giant cells usually contain more than 15 nuclei, arranged at one pole of cells, in a horse-shoe shaped pattern (Fig.6). These are formed by fusion of epithelioid cells.<sup>1-6</sup>

**Touton Giant Cells:** These cells were first described by Karl Touton. These are also called as xanthelasmatic giant cells whose characteristic appearance is determined merely by the presence of demonstrable lipids in their cytoplasm. Touton giant cells have a central ring of nuclei while the peripheral cytoplasm is clear due to accumulated lipids (Fig.7). These cells are formed by fusion of lipid containing macrophages. These MGCs are most frequently found in lesions containing cholesterol and lipid deposits and are associated with various pathologic processes such as xanthomas and xantho-granulomas.<sup>1</sup>

**Aschoff Giant Cells:** These cells are usually located in the interstitial tissues of the heart, especially in the myocardium and endocardium, often close to small blood vessels. Occasionally, they are present in the pericardium. These have been described in the adventitia of the aorta. Aschoff bodies have been found in a significant proportion of atrial

appendages. Aschoff nodules are globular, elliptical, or fusiform microscopic structures.

**Aschoff cells (modified Anitschow cells):** These are large, multinucleated giant cells with abundant basophilic cytoplasm, ragged cell borders and one to four nuclei (Fig.8). Other cells usually seen are lymphocytes, plasma cells and occasional neutrophils.<sup>6</sup>

**Reed Sternberg Cell/Dorothy-Reed-Sternberg Cells:**

The origin of RS cells remained mysterious through the 19<sup>th</sup> and most of the 20<sup>th</sup> centuries but was finally solved by elegant molecular studies performed on single micro-dissected RS cells. Presence of Reed-Sternberg cells is a pathognomonic feature for the diagnosis of Hodgkin's disease. It is a very large cell (15 to 45µm in diameter) with an enormous multilobed nucleus, exceptionally prominent nucleoli and abundant, usually slightly eosinophilic cytoplasm.<sup>6</sup> Particularly characteristic are the cells with two mirror-image nuclei or nuclear lobes, each containing a large (inclusion-like) acidophilic nucleolus, surrounded by a clear zone, features that resemble an owl-eye appearance. There are several morphological variants of RS cells which characterize different histologic sub-types of Hodgkin's disease: Classic RS cell is a large cell which characteristically has a bilobed nucleus appearing as a mirror image of each other but occasionally the nucleus may be multilobed (Fig.9);

Lacunar type RS cell is smaller and in addition to the above features, has a peri-cellular space or lacuna, in which it lies (Fig.10) which is due to artifactual shrinkage of the cell cytoplasm. It is characteristically found in nodular sclerotic variant of the Hodgkin's disease.

Polyplod type (or popcorn or lymphocytic-histiocytic i.e. L and H cell): This type of RS cell is seen in lymphocyte predominance type of Hodgkin's disease. This type of RS cell is larger with lobulated nucleus in the shape of popcorn (Fig.11);

Pleomorphic RS cells are a feature of lymphocyte depletion type of Hodgkin's disease. These cells have pleomorphic and atypical nuclei.<sup>6</sup>

**Tumor Giant Cells:** These giant cells are usually associated with poorly differentiated tumors. The

nuclei of these giant cells are pleomorphic, often diploid, show abnormal mitosis and resemble those of mononuclear tumor population.<sup>1</sup> It is unlikely that repeated nuclear division without cell separation could account for tumor giant cell formation since nuclei sharing cytoplasm normally form a single mitotic spindle, leading to the formation of a single, hyperdiploid nucleus (Fig.12) (Harris, 1968).<sup>8</sup> There is a second group of giant cells seen in tumors in which mitosis is almost never seen amongst the giant cell nuclei and in which the nuclei are uniform in size and shape. These cells are not formed by fusion of mononuclear neoplastic cells but arise as a reaction to the tumor. These are classified together as “ tumor associated giant cells”.

**Tumor Associated Giant Cells:** Tumor associated giant cells are seen less predictably in a variety of epithelial neoplasms where they appear as foreign body giant cells in response to the production of extracellular matrix by a carcinoma. They may be seen, for example, associated with keratin formation in a squamous cell carcinoma or around deposits of amyloid in medullary carcinoma of the thyroid and in some areas of other carcinomas of the thyroid.<sup>6</sup>

**Warthins Finkeldys Giant Cells:** Warthin found the significance of these cells in 1931 after the removed tonsils from four children, all of whom subsequently developed measles, within one to five days after tonsillectomy. These cells are found in lymph nodes or throughout the reticulo-endothelial system and are considered to be specific for and in fact, diagnostic of measles. The cells contain few to many small nuclei arranged in small morules or in a “grape-like” cluster, surrounded by a small amount of eosinophilic or basophilic cytoplasm, which often have resemblance with lymphocytes. These cells do not contain inclusion bodies (Fig.13). These cells have been found during the prodromal phase of measles and are seen to disappear soon after the appearance of clinical rashes. Warthins Finkeldys cells differ from the syncytial epithelial giant cells of measles both in location and morphology. Although others have emphasized these differences,

the syncytial type has still been referred to by some as the Warthins Finkeldys cells.<sup>9,10</sup>

**Tzanck Cells:** These cells are named after Arnault Tzanck, a French dermatologist. These are multinucleated giant cells with molding of the nuclei as they are crowded together. There is peripheral margin of the chromatin and a ground-glass appearance of the nuclei (Fig.14). These cells may also have bizarre, atypical shapes. Viruses cause abnormal cell divisions in epidermal cells and this creates these type of multinucleated giant cells.<sup>8</sup>

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Figures:

Fig.1:

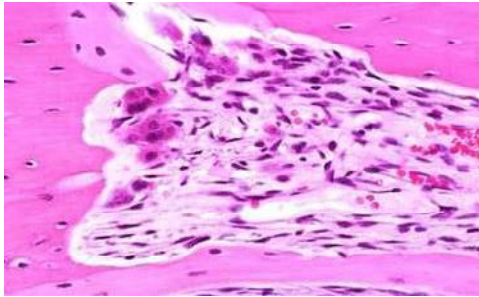


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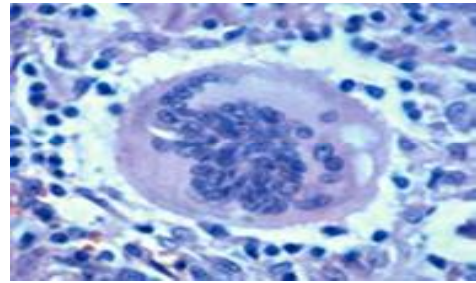


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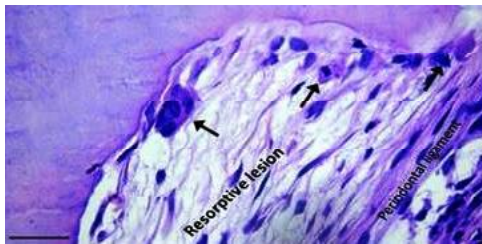


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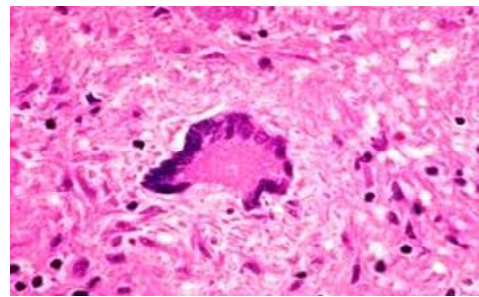


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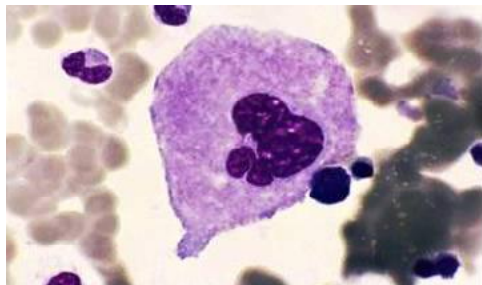


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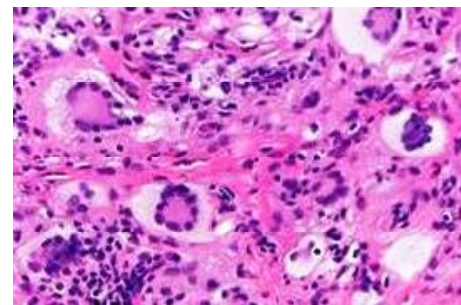


Fig.4:



Fig.8:

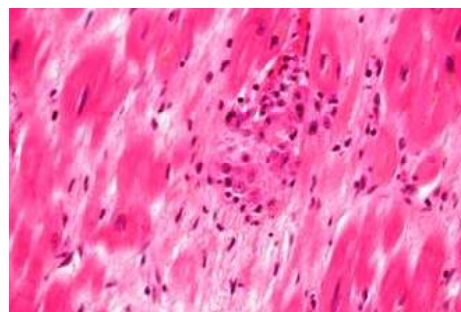


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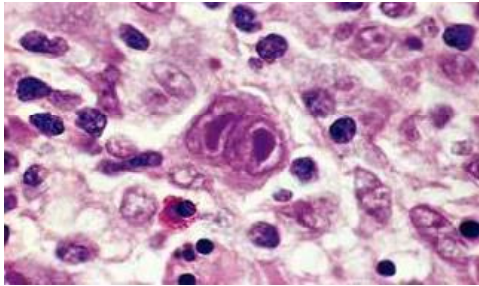


Fig.13:

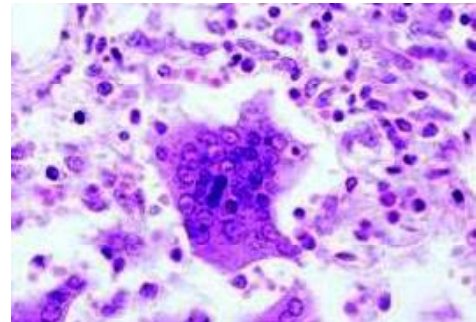


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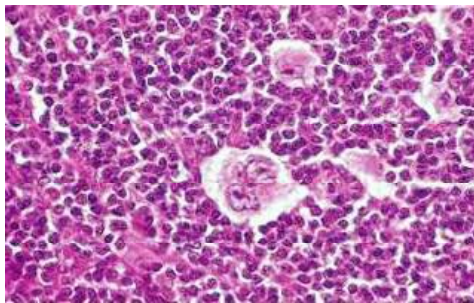


Fig.14:

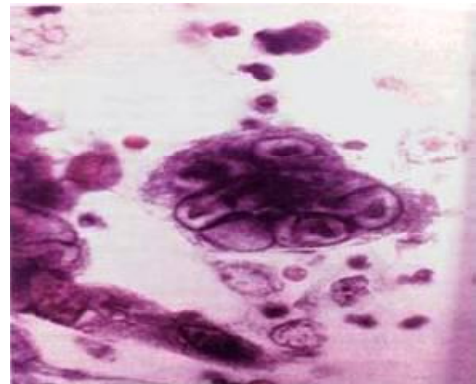


Fig.11:

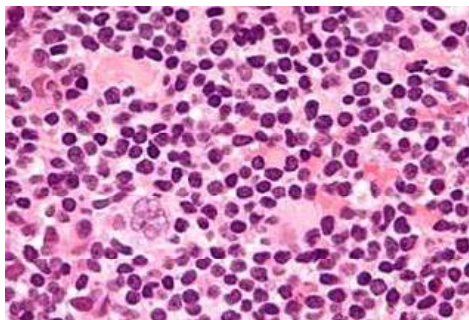
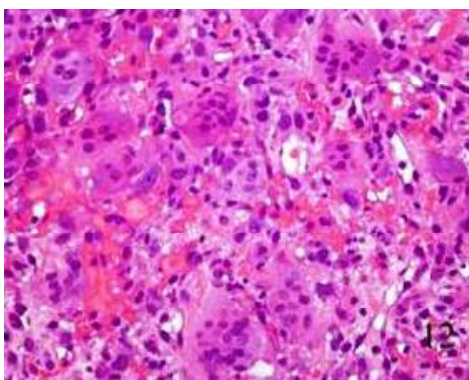


Fig.12:



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## 2 x 4 Appliance : A Novel for Early Correction of Anterior Cross Bite : A Case Report

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**Abstract:** The 2 x 4 appliance comprises a continuous archwire with pre-adjusted edgewise bracket on the maxillary incisors and bands on the first permanent maxillary molars. The appliance is used in the early mixed dentition for the treatment of both anterior cross bite and correction of the ectopic incisors. A case treated by using 2 x 4 appliance is being presented here. This appliance offers many advantages over alternative techniques including removable orthodontic appliances by providing complete bodily control on incisors, is extremely well-tolerated, requires no adjustment by the patient and allows accurate and rapid positioning of the teeth

**Key words:** 2 x 4 appliance, anterior crossbite

**Introduction:** Active interceptive approach in mixed dentition treatment is usually limited to the correction of anterior and posterior crossbites and alignment of ectopically placed incisors. In this regard, the 2 x 4 appliance (Fig.1) can be used in the mixed dentition.<sup>1</sup> This type of fixed appliance comprises bonds on the erupted maxillary permanent incisors and bands on the first permanent molars. Continuous archwires are used to achieve complete control on the anterior segment as well as ideal arch form. Orthodontic bonding of the deciduous teeth is unsuitable, therefore, bypassing deciduous teeth spans between the lateral incisors and first permanent molars. This segment should be carefully shaped to maintain a correct arch form and protecting it from the occlusal forces and potential distortion during the masticatory function. 2 x 4 appliance allows rapid correction of many developing malocclusions in a single, short phase of fixed appliance therapy in the early mixed dentition stages.<sup>2,3</sup>

**Case Report:** A 9 year-old boy reported to the Department of Orthodontics and Dentofacial Orthopedics with a chief complaint of a malpositioned front tooth. Extra-oral examination revealed a mesoprosopic face with incompetent lips (Fig.2). Intra-oral examination revealed a Class I molar relationship with a skeletal Class I base (Fig.3) with average mandibular plane angle. He was in the early mixed dentition phase and the lower arch was well-aligned with crowding in maxillary incisor

region with developing anterior cross bite. (Fig.3) On radiographic evaluation, it was observed that the root development of the incisor was completed. Treatment plan was formulated which included correction of crossbite by using 2 x 4 appliance. The 2 x 4 mechanotherapy is one of the most commonly practiced procedures today for early treatment of maxillary incisor crowding.<sup>4-6</sup> Bands were placed on maxillary first permanent molars while the incisors were bonded with standard 0.22 MBT Bracket and a 0.016 nickel-titanium archwire. (Fig.4a,b,c) The archwire sequence was 0.016 x 0.022 nickel titanium, 0.016 x 0.022 stainless steel and 0.017 x 0.025 stainless steel. Unfortunately, after six weeks, a bracket was debonded and the archwire was lost with evidence of relapse of the right central incisor. The bracket was rebonded and 2 x 4 appliance was placed after one month. After active treatment of 6 months, lip posture improved (Fig.5a,b) and a good facial profile was achieved (Fig.5c,d). A positive overjet and overbite were obtained as treatment outcomes (Fig.6a) while maintaining Class I Molar relationship on right (Fig.6b) as well as left sides (Fig.6c). In the following week, it was decided to debond and also, not to place a bonded retainer in this instance but to only monitor the position of the teeth and the developing dentition (Fig.6d,e).

**Discussion:** Maxillary incisor crowding, in mixed dentition stage of development, is one of the most frequent form of malocclusion. However, most of the case reports have focused mainly on mandibular

incisor crowding.<sup>1-3</sup> The resolution of maxillary incisor crowding in the mixed dentition stage has been made by length arch preservation with lingual arch, maxillary arch expansion with Quad helix, incisor alignment with two bands and four brackets (2 X 4) mechanotherapy, serial extraction and removable appliances. Use of removable orthodontic appliances is a good alternative for early correction of anterior crossbites. However, there is an inherent problem with removable appliances such as achieving full control on tooth movement is difficult and the fact that removable appliances can exert only single-point contact on teeth resulting in uncontrolled tipping movements in most of the cases. Also, these appliances require patient compliance and less acceptable to the patient, especially when at a difficult place, are ill-fitting and lead to excessive pressures on the surrounding soft tissues and teeth. Also, repeated use leads to a stress fracture of the retaining cribs or clasps resulting in poor retention. Ninou and Stephens enlisted the problems associated with removable expansion appliances including patient cooperation and retention of the appliance.<sup>7</sup> The successful treatment with removable appliances mostly depends upon patient compliance. Important factors associated with removable appliances also include a need for continuous wearing and frequent adjustments of the appliance. Also, removable appliances cause only tipping of the incisors during crossbite correction as compared with a 2 x 4 appliance which may produce some translational movement of the teeth during correction of the crossbite. All the above-listed problems can be overcome if an alternative to the conventional removable appliances is found. A 2 x 4 fixed appliance offers more effective and efficient tooth positioning as it allows three-dimensional control of the incisors during correction of anterior crossbites and/or aligning ectopic incisors. Rotations, diastemas and incorrect tooth inclinations and angulations may, therefore, be treated quickly using this versatile technique. The presented case here demonstrates the novel approach of the 2 x 4

appliance for the early correction of anterior crossbites and also, the alignment of the incisors. The objectives of treatment are achieved within a short course of treatment and results are maintained without a bonded lingual retainer. Future orthodontic treatment may be required in this case after the establishment of the permanent dentition, but, early treatment in these cases, helps in the normal skeletal development of the facial bones along with a quick restoration of the anterior aesthetics.

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# Mandibular Second Molar with a Single Root Canal : A Case Report

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**Abstract:** The inconstancy of root canal system morphology of multirouted teeth presents a continuous challenge to the endodontic diagnosis and therapeutics. This case report extends the magnitude of known possible anatomical variations to include teeth with lesser number of roots and root canals. Variations of root canal systems are not obligated in the form of extra canals. Clinicians should be acquainted with the possibility of existence of fewer number of roots and root canals than the conventional root canal anatomy. The aim of this case report is to present a case of a mandibular second molar with a single root canal which was successfully managed endodontically.

**Key words:** mandibular second molar, single root canal

**Introduction:** The success of endodontic therapy is based on the attainment of all treatment steps, especially complete removal of the bacteria and bacterial products from the root canal system during the cleaning and shaping procedures. Variations in dental anatomy are found in all groups of the teeth and acquaintance of these variations, particularly in relation to the location and treatment of all the canals, is crucial to a successful endodontic therapy. Routine periapical radiographs help us to assess the number, length, curvature and aberration of the root canal system of the teeth. Generally, anatomical configuration of mandibular second molar is that of two roots, mesial and distal, which are seen closer together than the first mandibular molar and can even, in rarities, be fused to a single conical root with varying internal anatomy and often having c-shaped canal configuration.<sup>1</sup> Slowey emphasized that root canal morphology was limitless in its variability and clinicians must be aware that anatomic variation constitute a formidable challenge to endodontic success.<sup>2</sup> C-shaped canal system is frequently found in mandibular molars especially in Asian population. Cimilli et al using spiral computed tomographic imaging concluded that the prevalence of C-shaped canals in single rooted second molars was 8%. Vertucci Type I canals were most frequently seen in these C-shaped canals.<sup>3</sup> A study conducted on Iranian population reported prevalence of 7.2% of C-shaped canals

among second mandibular molars and these configurations were mostly seen among single rooted mandibular teeth.<sup>4</sup> A study by Weine et al reported 1.3% of mandibular second molars having single canal configuration.<sup>5</sup> The intent of this case report is to report occurrence of single canal in single rooted mandibular second molar that required endodontic therapy.

**Case Report:** A 61 year old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in lower right back tooth region. The patient did not give a significant medical history. On clinical examination, mandibular second molar revealed a deep carious lesion. The patient had tenderness on vertical percussion. Intra-oral periapical radiograph (IOPAR) revealed an ill defined radiolucency involving the pulp suggestive of a pulpal involvement (Fig.1). Based on these findings, chronic irreversible pulpitis was diagnosed. Local anesthesia, inferior alveolar nerve block, was administered. Access cavity was prepared under rubber dam isolation (Fig.2). Examination of the pulpal floor revealed only a single round shaped orifice, which was classical C-shaped Type C4 canal orifice configuration. Any other canal orifices could not be located. Working length was determined with the help of electronic apex locater (Propex Pixi, Dentsply) and confirmed using an intra-oral periapical radiograph (Fig.3). Cleaning and shaping of the canal was done using step back



technique using suitable sized ISO K files. 4% sodium hypochlorite solution and saline were used for irrigation and re-capitulation. 17% aqueous EDTA solution was used as a final flush. The canal was dried with sterile absorbent points and then, coated with Sealapex (Sybronendo) sealer with lentulo-spirals and obturated with thermo-plastisized gutta percha (Fig.4) and restored (Fig.5).

**Discussion:** As with most posterior teeth, the maxillary and mandibular second molars have several inconstancy in their canal configurations. The standard presentation of the mandibular second molars is that of two roots and two, three or four root canals, and that of maxillary second molar is of three roots and two, three or four canals. Nonetheless, maxillary and mandibular second molars with a conical root and wide single root canal are also reported and this type of occurrence in mandibular second molars is described more often than in the corresponding maxillary second molars.<sup>6</sup> The C-shaped canal presents with an extensive complex system and is an anatomic variant seen mostly in mandibular second molars, although it can also appear in other maxillary and mandibular molars as well as pre-molars. The main anatomic feature of C-shaped canals is the presence of fins or webs connecting individual mesial and distal canals which makes the canal cross-sectional and 3-D shape variable along the root while presenting a challenge to debridement and obturation. Recognition of a C-shaped canal configuration, before treatment, can actually facilitate more effective canal identification and the determination of anatomic variations. Yi Min et al classified canal configurations in cross-sections into the following five types based on the combination of canal name and location.<sup>7,8</sup>

C1: continuous C-shaped canal;

C2: MB-D canal and an ML canal;

C3a: M canal and a D canal;

C3b: MB, an ML, and a D canal; and

C4: single round or oval canal.

Tamse et al reported the occurrence of bilateral symmetry in 89.65% of cases with single conical rooted mandibular second molars.<sup>9</sup> Manning et al,

in a study, reported that Asians have a higher frequency of single rooted mandibular second molars.<sup>10</sup> The morphological variants of single root and single canal are easily detected in routine radiographs. However, care should be taken to assess the correct anatomy on the pre-operative radiographs to rule-out the clinical conditions of two roots, one buccal and one palatal that could be superimposed on the diagnostic radiograph. Meticulous inspection through angled radiographs prior to and during endodontic therapy aids in identifying extra-roots and/or canals. The incidence of canal bifurcation is usually identified in radiographs by 'fast break' guideline which states that the sudden disappearance or narrowing of the canal infers the presence of canal division.<sup>11</sup> The clinician should be acquainted of all the anatomical variants and aberrant canal configurations. The clinician should then perform a comprehensive examination of the pulp chamber to assure complete debridement of all the canals. This increases the chance for a long-term successful endodontic therapy.<sup>12</sup> The aberrations in the root canal morphology need not always be extra-canals. It can also be in the form of fused or fewer canals. Knowledge and recognition of canal configuration can facilitate more effective canal identification and unnecessary removal of the healthy tooth structure in an attempt to search for the missing canals. From a clinical point of view, when an atypical anatomic form is encountered, multiple angled radiographs of the tooth in interest reveal more particulars of the anatomy of the root canal system.

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#### Figures:

Fig.1:



Fig.2:



Fig.3:

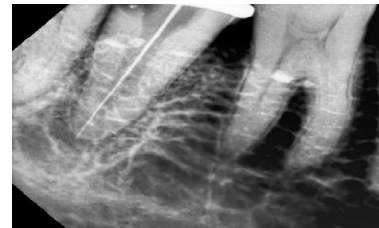


Fig.4:



Fig.5:



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# A single visit approach to the management of traumatic tooth crown fracture

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**Abstract:** An immediate restorative technique resolving the acute problem of traumatic tooth fracture with pulpal and periodontal involvement in which the fragment(s) are re-alignable; re-positioning facilitated by a fibre-post, using dentine/enamel bonding; a challenging, conservative and economically viable procedure within the compass of a single visit; herewith, we are presenting such a case report.

**Key words:** Single visit endodontics, traumatic tooth crown fracture

**Introduction:** Crown fractures have been documented to account for up to 92% of all traumatic injuries to the permanent dentition.<sup>1</sup> The number and extent of the tissues involved in the traumatic injury determine the management needs. Some fractures are minor, others are severe enough to result in the gross loss of the tooth involved. This case report outlines the management of one such case using previously accepted techniques<sup>2,3</sup> and introducing a means of re-locating and positioning tooth tissue fragments during re-attachment.

**Case Report:** A 28-year-old male reported to the Department of Conservative Dentistry and Endodontics complaining of a 'broken tooth'. He gave the history of trauma resulting from an accident which occurred on the previous day. Clinical examination revealed an un-restored maxillary central incisor with grade II mobility. Light periodontal probing indicated no apparent periodontal pocketing. A fracture line was seen extending sub-gingivally on the palatal aspect. The fracture was not evident labially. Further periodontal assessment showed the coronal tooth fragment to be still attached though by a fragile soft tissue junction around the labial aspect. The crown remained in its correct anatomical position with regards to aesthetics and the occlusion (centric occlusion). In considering maintaining the retained tooth portion, the periodontal condition was deemed healthy enough to allow for reasonable longevity. The retained root portion was also of adequate length and with a sound structure to allow for restoration, had this not been so, extraction

would have been considered a better option. As the patient was keen to retain the tooth and the root structure appeared to be sound in structure, a treatment plan was devised whereby the fractured crown was supposed to be re-attached to it. This required use of the conventional post-retention and adjunctional bonding of the abutting surfaces. Both root and crown surfaces were inspected under magnification. A clean fracture line extending horizontally from the mesial outline to the distal outline angulated cervically from palatal to the labial aspect was evident (Fig.1). No caries or resorption defects were detected. In order to prevent dehydration, the coronal tooth fragment (Fig.2) was stored in distilled water. Root canal treatment was carried-out under a slit rubber dam (Fig.3) which extended across the adjacent teeth. Working length determination was done by taking an intra-oral periapical radiograph (IOPAR) (Fig.4). Lateral compaction of gutta percha with AH plus sealer was used to seal the root canal (Fig.5). Post-obturation radiograph was taken (Fig.6). A venting cavity was cut palatally into the coronal tooth fragment (Fig.7) through the pulp chamber, after ensuring all pulpal tissue remnants had been removed. The root canal was then prepared with a Hyrem Post drill (No.3) to within about 5mm of the apical constriction. A corresponding Fibre post (Hyrem) was cut to the size allowing 3-4mm for the coronal fixation. The surfaces to be bonded (root surface and the crown surface) were pitted with dimples using a 1/2 round bur, washed, etched with 37% phosphoric acid and a dentine bonding agent was applied. Prime and bond

2.1. Dual cement (Dual cement, Ivoclar, Vivodent) was spun into the root canal and the titanium post was seated (Fig.8). Simultaneously, the coronal tooth fragment was placed into the stent and its bonding surface and pulp cavity were loaded with dual cure cement. This was placed into position and held until the cement was light-cured set (Fig.9). Post-operative photograph of the patient was taken for the sake of comparison of the pre-and post-operative clinical profile (Fig.10).

**Discussion:** Traumatic injuries involving tooth fracture can now be treated by re-attachment of the tissue fragments using an adhesive system (acting as a 'dental super glue') to provide what is considered to be the most conservative of all the restorative procedures.<sup>4</sup> Newer dentine bonding systems work with such efficiency that they easily allow for normal masticatory forces.<sup>5</sup> Survival rates for such restorations have been shown to be good with failure often only resulting from subsequent trauma.<sup>6</sup> Factors influencing the extent and feasibility of such repairs include the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time and resources of the patient.<sup>7</sup> Economical considerations when a re-attachment technique is employed often negate the use of expensive cast restorations. The advantages of using the original tooth fragment over all other materials may be listed to include:<sup>7</sup>

- Color;
- Morphology;
- Translucency;
- Physio-chemical characteristics (including wear, thermal and hygroscopic expansion);
- Patient acceptance; and
- Being structurally conservative; and
- Economical.

Some clinicians have even advocated restorations using hard dental tissue from donor teeth.<sup>8</sup> However, acceptance is unlikely because of practical considerations such as sterilization and patient attitudes and ethical concerns. Limitations of tooth tissue re-attachment include those associated with dental adhesion, in particular, control of operating field from contamination and force application,

particularly indirect or shear forces working in directions where bonding forces are weakest. Tooth preparation technique and extent is relative to the site and amount of the tooth fragment available for re-attachment. Where enamel margins are large compared with dentinal bonding area and the size of the fractured tissue for re-attachment is small, little or no preparation is desirable.<sup>9</sup> Conversely, where little enamel remains, increasing the bonding surfaces is desirable. One such means advocated is the adjustment of abutting surfaces to increase the surface area as well as to serve for the purpose of retention. If the fracture involves two thirds or more of the crown, a post-re-attachment is more commonly used.<sup>10</sup> Post placement is also to be considered in fractures where the patient exhibits a large overjet and/or para-functional habits such as bruxism. Post placement, in addition to bonding, serves to retain the coronal portion via a friction bond and assists in preventing dislodgement from the non-axial forces borne by the tooth.<sup>11</sup> Fragment alignment can be problematic, hence, the use of a press-form matrix stent is advisable. Sub-gingival fractures do not usually allow direct visualization, therefore, a matrix for re-positioning segments can be of great advantage. Apart from locating well, the clear stent allows the operator to see and so, check the positioning of the segments. Apposition can be affected by cement thickness as well as problems with re-location even when using a stent. These would include incorrect tooth segment placement, distortion of the plastic during seating and incorrect alignment of the stent itself.<sup>12</sup> Such problems similarly occur when the apposition is 'freehand', but with the added difficulty of maintaining position in the three dimensions without movement while the cement sets. Should the fragment be re-attached in an incorrect position, its function and aesthetics would be compromised. Removal of an incorrectly placed fragment is difficult and subsequent re-use of the fragment is almost always impossible.<sup>13</sup> Other treatment options available in the treatment of a fractured tooth include:<sup>14</sup>

- Root extraction and prosthetic replacement, eg., fixed and removable prostheses and implant placements;

- Root burial prosthetic replacements;
- Retention of the apical tooth portion and conventional conservation, eg., periodontal correction, if required followed by cast restorations;
- Orthodontic extrusion followed by restoration; and
- Surgical extrusion involving extraction and then, re-implantation and restoration.

However, many of the above techniques have associated limitations. These may include multi-visit appointments, cost, stabilization (splinting) and being less conservative in nature when compared with the current treatment option. For example, when considering the extrusion of a retained root, either orthodontically or, more rapidly, by surgery, follow-up splinting is often necessary requiring many visits. Endodontic therapy may also have to be delayed until the extruded tooth is stable (some 10 weeks later).<sup>15</sup> Also, if the fractured root margin is moved with orthodontics more coronally, it brings with it the periodontal tissues, requiring subsequent, periodontal surgery.<sup>15</sup> Other problems encountered are the reduction in root length for post-retention (although an improved crown:root ratio may be achieved, a shorter root may well result with the post-apex lying close to the alveolar crest giving undesirable stress concentrations, thus, increasing the probability of leading to root fractures). A reduced cross-sectional cervical diameter, also, produces restorative difficulties with respect to the embrasures.<sup>16</sup> The single visit, multidisciplinary approach, to a crown fracture requires consideration of periodontal, endodontic, restorative and occlusal factors. This presents a great challenge to the dental surgeon with regard to both the clinical skills and time management. Follow-up must involve assessment of occlusion, periodontium and subsequent, traumatic force reduction protocols. This may take the form of a night guard, sports' shield, or even subsequent, more conventional tooth strengthening, such as the placement of a full coverage restoration or porcelain veneer, should the fracture line become supra-gingival and accessible.<sup>17</sup>

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**Figures:**

Fig.1:



Fig.2:



Fig.3:



Fig.4:



Fig.5:

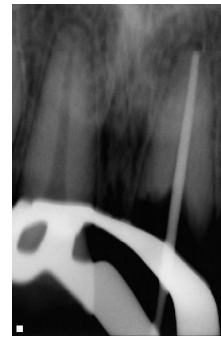


Fig.6:



Fig.7:



Fig.8:

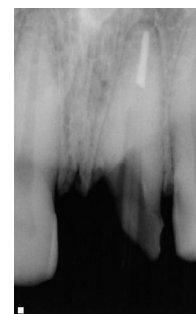


Fig.9:



Fig.10:



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# Role of Areca nut in Etio-pathogenesis of OSMF

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**Abstract:** Oral submucous fibrosis (OSMF, also OSF) is a chronic, progressive, insidious and disabling disease that not only involves the submucosa of the oral cavity and oropharynx but sometimes, also the oesophagus and rarely, the larynx. The main risk factors in OSMF include areca nut (also called betel nut) and its products. Arecoline, an active alkaloid found in areca nut, stimulates fibroblast production. The products of arecanut, including arecolin and arecaidine, can increase fibrogenesis and those of the flavanoids, catechin and tannins, increase cross-linking of the collagen fibrils rendering it resistant to the lytic activity of the enzyme collagenase. Data from recent epidemiological studies provides overwhelming evidence that areca nut is the main etiological factor for OSMF. A clear dose-dependent relationship has been observed for both frequency and duration of chewing areca nut.

**Key words:** OSMF, areca nut, betel quid

**Introduction:** OSMF is a chronic, progressive, insidious and disabling disease that not only involves the submucosa of the oral cavity and oropharynx but sometimes, also the oesophagus and rarely, the larynx.<sup>1,2</sup> The exact etiology of OSMF is not well understood. Various factors are being studied such as genetic, auto-immune, nutritional and environmental agents. Amongst the environmental causes, various chewing habits are observed to be associated with OSMF amongst which areca nut chewing is the most important and persistent finding. The main risk factors in OSMF include areca nut and its products. There is clinical, statistical and epidemiological evidence to prove the direct involvement of areca nut in the etio-pathogenesis of OSMF.<sup>3</sup> Furthermore, it has been found that collagen deposited in the tissues is mostly of the insoluble type.

## **Role of Areca nut in the etio-pathogenesis of OSMF:**

At present, it is proven beyond doubt that areca nut can induce OSMF. It was found that areca nut chewing has a causal relationship with OSMF on cytogenetic assessment of the role of areca nut consumption in the production of oral cancers. The current data highlights that it is an erroneous concept that this popular habit is “safe” and underlines the fact that it increases the genomic damage even when chewed without tobacco. The data also emphasizes the need for considering areca nut consumption as one of the confounding factors

in cytogenetic bio-monitoring. A study conducted on Khrame, a paste made of instant betel nut preparation, was painted in the oral cavity for a period of six months. During this period, the submucosal collagen increased steeply resulting in oral submucous fibrosis in 88.23% of the cases.<sup>4</sup> Areca catechu linn is commonly known as areca nut or betel nut. It is a widely cultivated plant in eastern countries like India, Bangladesh, Ceylon, Malaya, the Philippines and Japan and used for chewing purposes. It has an important place as a pharmaceutical medicine in Ayurveda and also, in Chinese medicinal practice, the pharmaceutical importance being due to the presence of an alkaloid, arecoline. A number of investigators have been able to produce cellular changes such as leukoplakia by application of betel quid or areca nut extracts to the buccal mucosa in different animals. There have been numerous studies confirming the same. A study conducted by Liao in 2001 proved that areca nut component of betel quid plays a major role in the pathogenesis of OSMF. Another study by Canniff in 1981 concluded arecoline, an active alkaloid found in betel nuts, to be the major stimulant of fibroblasts to increase production of collagen by 150%. Flavanoids, catechin and tannins in betel nuts, cause collagen fibers to cross-link making them less susceptible to the activity of lytic enzyme collagenase (Harvey, 1986). This results in increased fibrosis by causing both increased collagen



production and decreased collagen breakdown (Aziz, 1997).<sup>5</sup> OSMF remains active even after cessation of the chewing habit suggesting that components of areca nut initiate OSMF and then, affect gene expression in the fibroblasts which then, produce greater amounts of normal collagen.<sup>4</sup> The clinical investigation by Jian XC supports that chewing of betel nut is an important etiological factor for oral submucous fibrosis. In a case-control study done to elucidate the etiology of oral submucous fibrosis concluded areca nut to be the most important etiologic factor in oral submucous fibrosis.<sup>6</sup> Another study showed that HPV 16 and betel quid chewing were two major risk factors for oral squamous cell carcinoma (OSCC) in Taiwan indicating that they act through different mechanisms in the pathogenesis of OSCC. They undertook an epidemiologic survey about the history of betel nut quid chewing and cigarette smoking since these habits are common in Taiwan.<sup>7</sup> Betel quid chewing (adjusted Odds ratio = 17.06) remained to be an independent risk factor for development of OSCC. In an article titled "The oral health consequences of chewing areca nut" says that public health measures to quit areca use are recommended to control disabling conditions such as submucous fibrosis and oral cancer amongst Asian populations. There is also information linking oral cancer to pan chewing without tobacco suggesting a strong cancer risk associated with this habit.<sup>8</sup>

**Preparations:** A wide variety of areca nut preparations can be bought from the market: uncured, cured, whole, broken, wafered, shredded and commercially manufactured. Expensive varieties are finely cut, sweetened and flavored with condiments and spices such as cardamom, clove, saffron, cinnamon, and decorated with silver foils. The betel quid chewing habit evolved into several variants such as chewing of mawa, khaini, Mainpuri tobacco, and more recently, various brands of commercially manufactured and marketed pan masalas including tapkeer, Mishri, gudakhu, gutkha, thambaku, madhu, and star. "Quid" is defined as "a substance, or mixture of substances, placed in the mouth or chewed and kept in contact with the

mucosa usually containing one or both of the two basic ingredients, tobacco and/or areca nut, in raw or any manufactured or processed form." Based on the contents of the quid, clear delineations are recommended such as areca nut quid, tobacco quid and tobacco and areca nut quid, with finer subdivisions to be added, if necessary. The betel quid refers to any quid wrapped in betel leaf and is, therefore, a specific variety of quid. These recommendations were made in a workshop held in Kuala Lumpur, Malaysia, November 25-27, 1996. (Zain

R B ).<sup>9,10</sup>

- Quid with areca nut but without any tobacco products which may involve chewing only the areca nut or areca nut quid wrapped in betel leaf (paan);
- Quid with tobacco products but without areca nut including chewing tobacco, chewing tobacco plus lime, mishri (burned tobacco applied to the teeth and gums), moist snuff, dry snuff, niswar (a different kind of tobacco snuff ) and naas (a stronger form of niswar); and
- Quid with both areca nut and tobacco products (pan with tobacco).

A variety of packaged products from all three of these categories are now available in several countries. It is almost always possible to identify the presence or absence of the two principal ingredients of interest, areca nut and tobacco, and thus, to allocate the product to a specific category.<sup>10</sup>

**Etiopathogenesis of OSMF:** The stabilization of collagen in-vivo following damage to the oral epithelium by the tannin agents from areca nut may be the cause of fibrosis in OSMF. The discovery of areca nut as the major risk factor led to the analysis of the contents of areca nut masala/gutkha. By an irreversible process, there is alteration in the fibroblast population into three basic types: F1, F2 and F3. F1 gives rise to F2 and F2, in turn, gives rise to F3. F1 is more proliferative in nature whereas F3 is concerned more with synthesis of collagen. F2 is intermediate between the two. F1 secretes low levels of Type I and Type III collagen whereas F3 secretes more of Type I and Type III collagen. The collagen type, we see in OSMF, is more of Type I and

Type III. Hence, we can conclude that a shift in the fibroblast population takes place in OSMF. The over expression of lysyl oxidase, an enzyme, could be a factor which accounts for the shift in the fibroblast population in OSMF. Also, the reduced levels of this enzyme in Ehlers Danlos syndrome and increased levels in dilantin induced fibrous hyperplasia are strong evidences to support the role of lysyl oxidase in the production of excess, altered collagen. So, the presence of excess lysyl oxidase in OSMF can be the basis of increased collagen and fibrosis in OSMF.<sup>3,11</sup> The investigations that support the accumulation of collagen in OSMF found that the ratio of alpha (I) to alpha (II) chains was about 3:1 in OSMF affected tissues instead of the 2:1 expected for type I collagen. The excess alpha (I) chains could mean that collagen type I trimer was synthesized by the fibroblasts. Collagen overproduction and a reduced degradation of the structure stable collagen type I trimer might contribute to the accumulation of collagen in OSMF affected tissues in-vivo. Combined effects of the increased production and an impaired degradation of collagen describes a slightly different mode of action by which fibrosis is brought about. Here, also, the basic culprit is lysyl oxidase or to be exact, the excess copper content in areca nut. Factors supporting this hypothesis are listed below:<sup>3,4</sup>

1. There is high copper content in arecanut extracts;
2. OSMF is a condition found in patients with the habit of areca nut chewing;
3. There is high amount of tissue copper in cultures from OSMF affected patients. Also, there has been marked difference between the level of copper in the tissues of patients with OSMF and those of controls in the various studies conducted. In same patients, there was marked difference between affected area and normal site, the former having a high amount of copper;
4. In fibrotic diseases like Wilson's disease, Indian childhood cirrhosis, etc., there is impairment in the metabolism of copper which led to increased tissue copper and fibrosis. In Wineyard Sprayer's lung, there is observed a high amount of inhaled copper leading to fibrosis of lungs. High amount of dietary copper is also found to increase oral fibrosis;

5. There is an increased expression of lysyl oxidase in the biopsy samples in OSMF affected tissues. In the above mentioned fibrotic diseases, as well as dilantin induced hyperplasia, also, we can see an increased lysyl oxidase activity;

6. Lysyl oxidase is an enzyme secreted mainly by fibroblasts. The enzyme is transient in tissues and has a short half life. Copper is needed for the expression and functioning of the enzyme. In the presence of raised tissue copper levels, the enzyme is stabilized and its half-life is increased by copper getting attached to the binding sites. In the presence of raised copper levels, other tissues like smooth muscle cells, vascular endothelium and even, keratinocytes secrete lysyl oxidase. The extracellular increase in levels of lysyl oxidase suggests that other cell lineages are also taking part in collagen synthesis suggesting an increased production of collagen;

7. Lysyl oxidase plays an important role in the cross linking of collagen and elastin rendering them less susceptible to phagocytosis. The balance between synthesis and degradation maintains the integrity of the tissue environment. In non-inflammatory fibrotic lesions, fibrosis is mainly due to impairment of phagocytosis. In-vitro studies have shown that phagocytosis of collagen coated cells in cultures of OSMF affected tissues and those of normal tissues are markedly different, 35% and 75% respectively. There is an inverse relationship between copper and zinc. Zinc is an essential trace element which is needed for the integrity of the epithelium. The increased copper level reduces the tissue zinc levels accentuating the toxic effects of copper, further, increasing the neoplastic potential of copper. In short, the increased copper in areca nut, jeopardizes the homeostasis between collagen synthesis and degradation. Collagen synthesis is increased by mild increase in fibroblastic proliferation and moderate increase in collagen synthesis. At the same time, there is reduction in collagen degradation by impaired phagocytosis. All these finally end-up in an increase in collagen in the submucosa leading to fibrosis.<sup>3,4,11</sup> On further analysis, the action of areca quid on oral mucosa is not that simple and is not

dictated solely by the duration of exposure to it or by simple process of passive diffusion.<sup>12</sup> Increase in fibrotic cytokines and decrease in anti-fibrotic cytokine are important in this regard. Cytokines play an important role in regulating the functions of fibroblasts including proliferation, migration, matrix synthesis and degradation. In an in-vitro study with peripheral blood mononuclear cells of OSMF patients and normal healthy adults, there was observed an increase in the level of fibrotic cytokines like Interleukin-1 (IL-1), Tumor Necrotic Factor-alpha (TNF-alpha), Interleukin-6 (IL-6) and Interleukin-8 (IL-8) and a decrease in the level of anti-fibrotic cytokines like Interferon-gamma (INF-gamma) in OSMF patients as compared to the control group. In fibrotic lesions like keloids and conditions like scleroderma, there is a downregulation of INF-gamma. There is clinical evidence that local injection of INF-gamma reduces fibrosis in both keloids and OSMF. Also, the products of areca nut, arecolin and arecaidine, can increase fibrogenesis and those of the flavanoids, catechin and tannins, can increase cross linking of collagen rendering it resistant to the activity of lytic collagenase. Here also, the suggested mechanism is an imbalance between collagen synthesis and degradatio but through a different route.<sup>11</sup>

**Conclusion:** The data collected by numerous studies conducted till date prove areca nut with or without tobacco use to be an important, independent risk factor for the development of oral squamous carcinoma (OSCC).<sup>13</sup> Gutkha contains all the constituents of pan masala along with tobacco. In addition to oral cancers, it is implicated to cause another major problem, oral submucous fibrosis, which independently leads to eventual morbidities and a risk of conversion to frank OSCC. Oral submucous fibrosis among gutkha users seems to develop very rapidly and it is reported that there is an impending danger of an epidemic of oral submucous fibrosis in future especially amongst the young adults.<sup>14</sup>

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# Hemisection : A Case Report

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**Abstract:** Hemisection refers to sectioning of a multirouted tooth into two halves followed by removal of the diseased root and its coronal portion. The aim of this case report is that periodontally compromised teeth with severe bone loss may well be retained by removal of one or more of their diseased roots and with endodontic treatment of the remaining root. The edentulous space created subsequently can then be restored with a fix partial denture.

**Key words:** broken teeth, hemisection, endodontic treatment, fix partial denture

**Introduction:** Tooth resection procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth. Hemisection denotes removal or separation of the diseased root with its accompanying crown portion.<sup>1</sup> If the decay is limited to one root, a hemisection procedure may be possible. This procedure represents a form of conservative dentistry aiming to retain as much of the original tooth structure as possible.<sup>2</sup> Weine has listed the following indications for tooth resection:<sup>3</sup>

Periodontal Indications:

1. Severe vertical bone loss involving only one root in case of a multirouted tooth;
2. Through and through furcation bone loss;
3. Unfavourable proximity of roots of adjacent teeth preventing adequate hygiene maintenance in proximal areas; and
4. Severe root exposure due to dehiscence.

Endodontic and Restorative Indications:

1. Prosthetic failure of abutments within a splint: If a single or multirouted tooth is periodontally involved within a fixed bridge, instead of removing the entire bridge, if the remaining abutment support is sufficient, the root of the involved tooth is extracted;
2. Endodontic failure: Hemisection is useful in cases in which there is perforation through the floor of the pulp chamber or pulp canal of one of the roots of an endodontically involved tooth which cannot be instrumented;
3. Vertical fracture of one root: The prognosis of vertical fracture is guarded to poor. If vertical fracture traverses one root while the other roots are unaffected, the offending root may be amputated; and

4. Severe destructive process: This may occur as a result of furcation or sub-gingival caries, traumatic injury, and/or large root perforation during endodontic therapy.

**Contraindications:**

1. Strong adjacent teeth available for bridge abutments as alternatives to hemisection;
2. Inoperable canals in root to be retained; and
3. Root fusion making separation impossible.

**Case Report:** A 25 years old male reported to the Department of Conservative Dentistry and Endodontics with intermittent pain in lower right back tooth region. Intra-oral examination revealed mandibular 1st molar to be extensively carious on the distal aspect of tooth (Fig.1). Radiographically, the tooth presented with a good periodontal support with less bone loss on the mesial side of tooth. Also, only the distal aspect of the tooth was destroyed by the carious process (Fig.2). In the 1st appointment, root canal therapy was started in relation to the mesial root of the tooth. Cleaning and shaping of the canal was performed and Ca(OH)<sub>2</sub> dressing was given. In the next appointment, obturation was done in relation to the mesial root (Fig.3). A muco-periosteal flap was raised to expose the bony crest preparatory to the hemisection procedure. The mesial and distal roots were sectioned at the level of the furcation. The distal root was extracted. A finishing diamond bur was used to smooth the distal area of the mesial root and its coronal portion and the flap was repositioned and sutured (Fig.4). Post-obturation radiograph was taken (Fig.5). Platelet rich fibrin (PRF) (Fig.6) was placed for hastening the process of healing and controlling post-surgical

inflammation.<sup>4</sup> After 2 weeks, upper and lower impression was taken and sent to laboratory. When the laboratory fabricated fixed partial denture was received, the temporary denture was removed. Proper seating was verified. Occlusion was checked with articulating paper and the fixed partial denture was cemented with an autocure resin-based cement (Fig.7). At the follow-up visit, occlusion was found to be stable, there was no inflammation of the surrounding soft tissues and the patient was satisfied with the outcome.

**Discussion:** Success of root resection procedures depends to a large extent on proper case selection. Factors like bone loss, angulation and position of the tooth in the arch, divergence of the roots, length and curvature of roots are all the deciding factors in the success of such restorative procedures.<sup>1</sup> Implant therapy is a predictable option with good functionality.<sup>2</sup> However, in this case, the patient chose an alternative treatment option. Hemisection can be selected as an appropriate treatment alternative in cases where one of the roots has a decay which is beyond the scope of restoration.<sup>5</sup> The prognosis for hemisection is the same as for routine endodontic procedures provided that case selection has been correct, the endodontics has been performed adequately and the restoration is of an acceptable design relative to the occlusal and periodontal needs of the patient.

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**Figures:**

Fig.1:



Fig.2:



Fig.3:

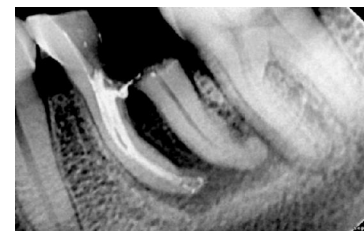


Fig.4:



Fig.5:

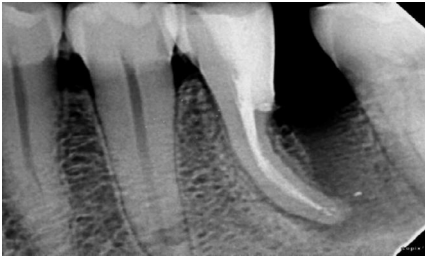


Fig.6:



Fig.7:



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