

Histopathological evaluation of pericoronal tissues associated with embedded teeth

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Tooth impaction or embedment occurs frequently, and diagnosing the presence of associated pathology with the pericoronal tissues of it can be more complicated for the clinician. The associated lesions of the pericoronal tissues of embedded teeth may vary considerably and impaction or embedment of tooth and associated pathology can result in various harmful destructions of the surrounding tissues. The accurate diagnosis of pathology associated with the pericoronal tissues of embedded teeth was doubtful with radiographic analysis, therefore histopathology evaluation of these tissues by analyzing and interpreting the sizes, shapes and patterns of cells within the dental follicle can be gold standard examining tool. This article is to compare the differentiations of the pericoronal tissue lesions by radiography and Histopathologic examination. Histopathological examination of pericoronal tissues of embedded tooth can help the practitioners to make accurate diagnoses and can plan a better treatment. After such examinations, clinicians can conclude that whether there is development of pathologic change in the pericoronal tissues of embedded teeth. This study highlights the importance of early detection of the pericoronal pathosis and the mutual work of the oral radiologists, surgeons, and the pathologists.

Keywords: pericoronal tissues; embedded tooth; dentigerous cyst; dental follicle; ameloblastoma; histopathological examination; tooth eruption; pericoronal radiolucency.

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Introduction

Impacted or embedded tooth can be called as tooth, which has failed to erupt partially, or completely to its precise position in the dental arch and its eruption potential has been lost. There are numerous theories that explain the impaction of teeth and impacted tooth can be associated with various pathological conditions especially with soft tissue surrounding it. Incidence of tumors and cysts associated with impacted third molars and other embedded teeth are of low prevalence, which might be owing to the truth that almost all pathologies go undetected as several clinicians dispose the tissue post- surgical extraction of the impacted or embedded teeth rather than dispatching the tissues to be examined histopathologically [1]. The follicular and soft tissues around impacted third molars may likely development of pathology [2], however, it is usually assumed that if the radiolucency is absent with abnormality, it might indicate the presence of a normal dental follicle. An impacted tooth can result in periodontal disease, carious lesions, destruction of adjacent teeth, infection, and to an extent of oral and maxillofacial cysts or tumors. It has been found that cystic or neoplastic lesions emerge in close proximity to the impacted tooth, most commonly during the second, third and fourth decades of life [3]. Therefore it is necessary to examine the histopathological condition of the soft tissues associated with embedded teeth.

One of the most common reasons for extraction of teeth is the infraosseous location of the teeth after the anticipated eruption period. During the evolution process, the jaws have turned smaller than before, creating less space for the teeth and causing various oral and dental problems [4]. There is also difference in sequence of eruption of teeth and a study found out that eruption times are gender affiliated. Eruption of

teeth in young females is sooner than the young males [5].

The wisdom teeth; third molars are regularly impacted because these teeth are the endmost teeth to erupt in the oral cavity [6] and the maxillary cuspids are second most regularly impacted teeth right after the mandibular third molar impactions. The least embedding occurs with the supernumerary mesiodens and at times with the mandibular canines. There are times when tooth fails to erupt in the oral cavity owing to pathologic conditions such as hyper IgE syndrome [4], the teeth even after their root have reached full length, eruption into oral cavity fails. Complete retention of impacted teeth within the alveolar process can lead to the associated follicular sac being retained along with it.

Pericoronal radiolucency is a regular radiographic finding seen in dental practice; they frequently show normal or bigger follicle that in which intervention is not required. Radically, they may portray a pathological existence that needs specific management and histopathological determination and interpretation. The most commonly found pathologic condition associated embedded teeth is with the mandibular third molar and dentigerous cyst is the frequently encountered lesion [7].

Histopathological examination of tissue obtained after biopsy remains the gold standard for the diagnosis of soft tissues associated with embedded teeth [8]. Performing biopsy and getting the precise tissue that represent the lesion is fundamental in treatment planning. Excisional biopsy or incisional biopsies are done for histopathological examination of periapical tissues, which is held during the extraction of the teeth. Histopathology is an branch of sciences which analyzes and interprets the sizes, shapes, and forms of cells and tissues within a given specific clinical background and to come to diagnosing it accurately [9]. This is useful in

establishing the pathogenesis and pathology of any disease caused by microorganisms.

Tooth eruption

Eruption is the when developing teeth penetrates through the jawbone and the mucosa, which overlies of it to come out in the oral cavity and ascend till plane of occlusion. There are various studies conducted in relation to eruption of teeth and histopathological evaluation of soft tissues associated with embedded teeth. There are numerous teeth erupting into the mouth according to the expected time of eruption. Why tooth begin to erupt and what forces it to advance eruptively and afterwards to culminate these movements of eruption is unknown. In the study by Svendsen [10], it is hypothesized that impaction of third molar in the lower jaw is an outcome of late maturation of third molar and early maturation of skeleton. A valid correlation has been depicted between eruption time and maturity of dental structure. Permanent tooth can erupt ectopically and most of time, third molars are most commonly impacted teeth [11]. Maxillary cuspids are the second most frequently teeth to be impacted and a study by Sacerdoti and Bacceti showed prevalence rate of cuspids displaced in palatal position was 2.4% with female to male ratio of 3:1 in a sample of 500 individuals [12]. There are teeth like premolars, mesiodens and other supernumerary teeth getting impacted as they defy the normal eruption course.

Normal histological features of dental follicle associated with embedded tooth

Histopathology is the branch of pathology, which concerns with the demonstration of minute structural alterations in tissues as a result of disease [9]. The pericoronal radiolucency is common radiographic finding to recognize a normal or pathologic condition of the tissues associated with embedded tooth [13]. While examining the dental follicular tissues under the

microscope, if fibrous connective tissue is present along with remnants of reduced enamel epithelium in the connective tissue and epithelial lining is absent suggest the normal tissue of dental follicle [14-15] There will be absence of epithelial lining in case of other embedded teeth: the absence, which is otherwise, is debatable. Various literatures' showed the struggle in the initial diagnosis of change in pathology the of follicle because the radio graphical appearance may not be a dependable measure of the disease's absence in pericoronal tissues or the dental follicle [16], so histopathological examination is useful in establishing the pathogenesis and pathology of any disease caused by microorganisms.

The width of the pericoronal radiolucencies with associated tooth is one of utmost important in identifying dental follicle pathologies. In the radiographs, dental follicle is demonstrated as pericoronal radiolucency hallow with a 2 mm to 2.5 mm width in normal condition. Radiolucency more than 2mm to 3 mm width could be considered as an indicative of pathologic change in the dental follicle [17]. So, dental follicle with absence of epithelial lining and having width more than 2-3 mm during radiographic examination could be the suggestive of pathology associated with it. Glosser defined presence of pathology in radiograph as a pericoronal space of more than 2.5 mm or larger [18] and again there are studies proving the above statement wrong.

Pathologic conditions associated with surrounding tissues of embedded third molars.

As mentioned above the most commonly found pathologic condition associated embedded teeth is with the mandibular third molar and dentigerous cyst is the frequently encountered lesion [7]. So, in this if there are presence of a dense, fibrous connective tissue wall lined by few layers stratified squamous epithelium; it is suggestive of dentigerous cyst. In the study of Rakprasitkul found that incidence of 58.65% of

dentigerous cyst was associated with third molars [11]. Recent study by Vijayalaskmi et al has shown that out of 41-pericoronal tissues evaluated histopathologically, 18 follicles were suggestive of dentigerous cyst, which is more than 50% of the pathologic conditions associated with third molar impaction [19]. However in the study by Anand et al. "the histopathologic evaluation of follicular tissues associated with impacted lower third molar" found that more than 50% were suggestive of normal tissues [13] and 80% were suggestive of normal follicles according to a study by Tambuwala et al. [20]. In another study, "The incidence of cystic change in impacted lower third molar" by Shridevi et al found that cystic changes were predominant in the males as compared to the female but not statistically significant. In this study out of 73 specimens, 16(22.1%) were suggestive of dentigerous cysts [21]. Same as the above study Lin's study also concluded that male predominance in dentigerous encounters [22]. Of the largest sample size (2646) in a retrospective series study by Alice et al. found that 28.4% were dentigerous cysts as most commonly found pathology [7]. According to these various studies mentioned, the most encountered pathology is suggestive of dentigerous cyst.

Apart from the normal tissues (dental follicle) and presence of dentigerous cyst after histologic examination, other pathologic conditions were also detected in the pericoronal tissues of embedded third molars. Various pathologic conditions like chronic non-specific inflammatory tissues, odontogenic keratocyst (OKC) and ameloblastoma were found in the pericoronal tissues of third molars which are impacted [11, 15]. According to various studies, averagely second most encountered was the odontogenic keratocyst. Odontogenic keratocyst is a rare and benign but locally aggressive developmental cystic neoplasm usually found at the posterior part of the mandible.

The presence of chronic granulation tissue in the soft tissues were suggestive of chronic

non-specific inflammatory tissue and OKC was suggested if there was presence of cyst-like lesion with orthokeratinization and many layers of stratified squamous epithelium according to study by Rakprasitkul et al. [11]. An ameloblastoma showed the presence of ameloblastic tumor cells and fibrous connective tissues according to study by Güven et al. [23]. According to a retrospective study, 2646 pericoronal lesions received over six-year period were reevaluated and found that dentigerous cysts are the frequently found jaw lesion in this category, followed by odontomas, unicystic ameloblastomas, and keratocystic odontogenic tumors. The least commonly encountered lesions are calcifying epithelial odontogenic tumors and calcifying odontogenic cysts [1].

There are various pathologic conditions that are associated with embedded or impacted third molars in which it mandates their histopathological examination is necessary according to the findings. So, it is appealing to consider prophylactic extraction of impacted mandibular third molar exhibiting at an early decade of life, whereas extraction remains controversial for old aged group and should only be accounted suitable in those individuals where exact causes for its extraction are known. There are various studies indicating about the occurrence of dentigerous cyst that causes significant morbidity to the patient around the fourth decades of life. Severin [24] found no development of cysts in 34 dental students studied for four years and also Knutson found no cysts or tumors under the age of 38 year in 170 patients. These studies indicate that pathologic morbidity doesn't usually occur during the early decades of life. Berges, Hinds and Frey and Bruce found that patients who needed hospitalization or dentigerous cyst causing serious morbidity were found in the mean age of 44.7, 47.7 and 46.5 years respectively. According to the studies mentioned above, we may conclude that severity of the diseases associated with the pericoronal tissues

of embedded teeth are found usually at the fourth decade of life. Curan [7] identified six carcinomas among the pathologically significant cases, all existed in the fifth to eighth decade in the study for course of six years, so we may draw that severity of pathologic lesions increases with age.

Pathologic conditions associated with surrounding tissues of embedded canines and other teeth

Canines or cuspids are most commonly impacted teeth, second only to third molars [25] in which maxillary canines being more impacted than the mandibular canines: canine impaction is prevalent at 1-2% in the population generally [26] But there is limited study on the pathologic conditions of tissues associated with embedded canines as well as normal tissues of the canines. There are various ways in which both maxillary and mandibular canines can be embedded and these teeth can lead to decaying of teeth, migration of the neighboring teeth, loss of arch length, cystic lesions, tumors and infection [27], the most important consequence of cuspids erupting in abnormal path within the dento-alveolar process is nearby lateral incisors' root resorption, whereby jeopardizing their longevity. However there are few case reports suggesting of dentigerous cysts associated with the surrounding tissues of embedded canines [28, 29] by Agacayak and Salati encountered dentigerous cyst in their respective studies or cases. And also in a case report by Buyukkurt found an embedded mandibular canine associated with dentigerous cyst [30] and same in a case report by Utami. [31] Whereas post-evaluating the cone beam computed tomography scans of 79 upper impacted cuspids and the dental follicle width, they found 59 cases have normal dental follicle width in a study by Albergaria da Silva et al., but they didn't mention about the histopathological condition of the other abnormally wide dental follicle in 20 cases [32].

Again there is not much of a literature concerning or explaining the follicular tissues

associated with embedded teeth like impacted mesiodens and impacted mandibular premolars but there are few cases reported. Case report by Khambete et al found association dentigerous cyst with an impacted/embedded mesiodens [33]. In another case reported by Kessler et al mentioned about the incidence of dentigerous cyst found with embedded mesiodens in the anterior maxilla [34]. Apart from dentigerous cysts, De Santana Santos et al also encountered ameloblastoma in 14 cases out of 112 mesiodens according to his study in Brazilian population [35]. There are very limited studies in case of embedded premolar and also in case of the supernumerary teeth. So, after encountering various periapical pathologies in relation to different embedded teeth, the question still remains as to remove it or not as some studies weigh in for more findings of normal dental follicle.

Discussion

According to the reviewed articles, the diagnosis of pathology associated with the pericoronal tissues of embedded teeth is more convenient with histopathological examination. Radiographic examination of these pathologies is an assist to the earlier examination. The findings from the various studies are suggestive of occurrence of pathologies associated with embedded teeth and their diagnosis and treatment plan may vary considerably. There are various studies supporting the extraction of embedded teeth before there is formation of cyst or tumor along the associated soft tissues of the embedded teeth.

The study of Shridevi et al. found that the incidence of cystic change in impacted third molar justifies extraction of the impacted tooth associated with symptoms [21]. However a study showed there is no presence of valid evidence to encourage removal for prophylaxis, there appears to be minor rationalization for the extraction of impacted third

molars which are pathology-free [36]. In the end all asymptomatic embedded teeth should be submitted to radiographic examination and in the event of extraction with increased pericoronal radiolucency, the pericoronal dental follicular tissue acquired should be sent for histopathological examination. According to study by A Esen et al found that delaying impacted third molar removal can lead to more pathological changes in follicular tissues and can aggravate the inflammation.

Adelsperger et al. figured that the incidence pathological conditions in pericoronal tissues is greater than generally presumed from just radiographic examination [16]. So, radiographic findings and appearance in it may not be a dependable indicator of the disease's absence enclosed in a dental follicle, Naves et al. recommended histopathological evaluation of all follicle tissue removed surgically, even when clinical and radiographic findings are not in favor of pathological amendment [37].

The occurrence of pathology may differ according to the age of the individual and according to these reviewed articles; the pathologic conditions around the pericoronal tissues are likely to occur in the fifth decade of life. If not examined earlier, the pericoronal tissues can be turned to carcinomas as reported by Curan. [7]

The width of the pericoronal radiolucency with associated tooth is of utmost important in identifying dental follicle pathologies. This article focuses on those teeth, which fail to erupt, get embedded or impacted into the oral cavity, and present a challenge to the clinicians. Asymptomatic presentation and accidental finding of these lesions present diagnostic dilemmas between a physiologic and the pathologic process.

Although clinical presentation and radiographic examination might provide some amount of evidence to pathology associated with pericoronal tissues of embedded teeth yet it can be the decisive measure for diagnosing the accurate pathology. Therefore, the

histopathological examination of dental follicular tissues remains the gold standard to come to affirmative diagnosis despite of the size of follicle seen in the radiograph.

In conclusion after all review of the articles, histopathological examination of pericoronal tissues of impacted or embedded teeth remains superior to conventional radiographic technique so, it is commendable for examining the unsuspected pericoronal tissues.

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