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MESIODENS: THE MOST COMMON CASE OF HYPERDONTIA – PRESENTATION OF RADIOLOGICAL CASES

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ABSTRACT

Mesiodens is the most common case of supernumerary teeth. It is a very usual developmental abnormality of permanent dentition, either accompanied or not by painful symptomatology and other pathological findings. Mesiodens are often detected by chance, through patients' radiological examination for other reasons. So, radiology and its methods assist in the radiographic estimation of a mesiodens. The purpose of this study is to present the valuable contribution of oral radiology in detecting asymptomatic mesiodens and determining their exact position. Four radiological cases have been chosen for this study. The four patients belong to different age groups (29, 9, 64 and 71 years old accordingly) and are of both genders. Each one came to the School of Dentistry for different dental treatments. Three different radiological techniques of oral radiology have been applied for their examination, namely periapical, panoramic and cone-beam computed tomography radiographs. In all cases, the mesiodens were impacted and asymptomatic, thus detected by chance through the conducted radiographic evaluation. In case of mesiodens, radiology contributes significantly in determining the tooth's characteristics, as in most cases the mesiodens is impacted. All radiographic methodologies presented in this study are essential not only for the diagnosis, but also for the surgical management of mesiodens. In case of prosthodontic treatment in edentulous patients, orthodontic treatment or at the presence of pathological findings, the impacted mesiodens should be extracted. Otherwise, the decision depends on the clinical and radiological findings.

KEYWORDS: cone-beam computed tomography, mesiodens, panoramic radiograph, periapical radiograph.

INTRODUCTION

Supernumerary teeth are a relatively common condition that oral and maxillofacial surgeons have to deal with in everyday clinical practice. These teeth arise when one or more additional tooth germs form and, as a result, the number of teeth exceeds the normal [1]. The most common site of supernumerary teeth is the central anterior region of the upper jaw, called premaxilla, even though the anterior mandibular area is also usual [2, 3]. They are the most common developmental abnormality of permanent dentition [2]. Supernumerary teeth detected between the two maxillary central incisors are defined as mesiodens and they are the most common type of supernumerary teeth [1, 2, 3]. Mesiodens may present as a part of various syndromes, however they are also seen in non-syndromic clinical cases [2, 4]. Such teeth may follow various paths of eruption, so they may erupt normally, may be found impacted as usually, may erupt in an inverted position or even take an ectopic position [2]. The aim of this study is to present the valuable contribution of oral radiology in detecting asymptomatic mesiodens and determining their exact position.

MATERIALS AND METHODS

For the purposes of our study, four radiological cases of mesiodens have been chosen and are being presented. The patients belong to different age groups (29, 6, 64, 71 years old accordingly) and both genders are being represented through the presentation of their radiographs. These patients came to the School of Dentistry of Aristotle University of Thessaloniki, Greece, in order to undergo several dental treatments. The radiographic examination of these patients included a variety of radiographic techniques, and more specifically periapical, panoramic and cone-beam computed tomography. In this way, one may understand the valuable contribution of each of those radiographic methodologies in evaluating mesiodens.

RESULTS

The 1st case is an adult female patient, 29 years old, without any systemic diseases and regular drug treatments. The patient came to the School of Dentistry of Aristotle University of Thessaloniki voluntarily, in order to undergo restorative dental treatments. Through the radiological examination of the patient with periapical radiographs, a horizontally inverted impacted tooth between the roots of the upper central incisors was detected *(Fig1)*. There were no symptoms regarding the mesiodens and the patient was unaware of the presence of the impacted tooth. The patient was advised to repeat radiological observation of the tooth regularly and to consult a specialist in case the mesiodens triggers painful symptomatology.

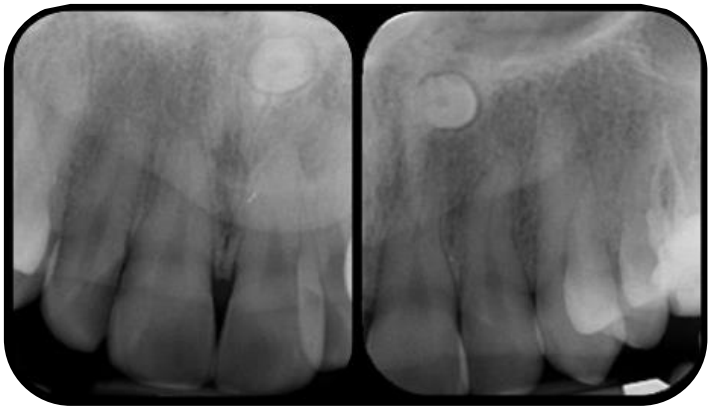

Fig1 *(The periapical radiographs of the 1st radiological cases.)*

The 2nd case is a male teenager, 9 years old, without any systemic diseases and regular drug treatments. The patient came to the School of Dentistry of Aristotle University of Thessaloniki, accompanied by his guardian, in order to undergo orthodontic and pediatric preventive treatments. After his radiological examination with an orthopantomographic radiograph, the radiologists concluded that a mesiodens was present between the roots of the upper central incisors, in close relationship with the left maxillary central incisor *(Fig2)*. There were no symptoms bothering the patient. The patient had been informed about the presence of the impacted tooth by his dentist. Even though it remains asymptomatic, both the dentist and the staff of the Radiological Laboratory of the School of Dentistry proposed to extract the mesiodens as soon as possible. So, the guardian was prompted to schedule the surgical extraction, so that the orthodontic treatment is successful.

Fig2 *(The orthopantomograph of the 2nd radiological case.)*

The 3rd case is an adult male patient, 64 years old, who has undergone pancreatectomy and splenectomy due to malignant neoplasm. The patient came to the School of Dentistry voluntarily, in order to undergo prosthodontic treatments for his missing teeth. The initial examination included an orthopantomography, through which a mesiodens was detected. It was found impacted under the anterior nasal spine in accordance to the initial position of the patient's maxillary central incisors before their loss *(Fig3)*. The impacted mesiodens is vertically orientated. The patient was advised to proceed with its extraction before the prosthodontic treatment, in order to avoid future complications regarding the dental prosthesis.

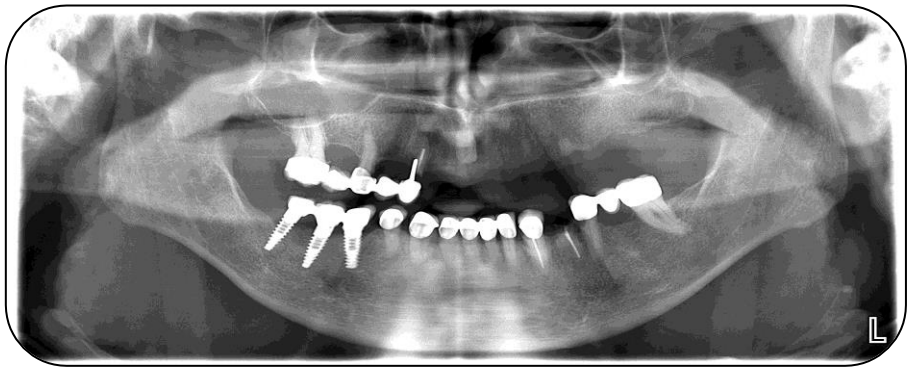

Fig3 *(The orthopantomograph of the 3rd radiological case.)*

The 4th case is an adult male patient, 71 years old, who receives regular drug treatment for cardiovascular disease. The patient is under prosthodontic treatment with implants in the School of Dentistry of Aristotle University of Thessaloniki. His initial examination with orthopantomography revealed the presence of an impacted tooth in the area of premaxilla. So, cone-beam computed tomography (CBCT) was decided to determine the nature of this tooth, its exact position and relationship with the adjacent anatomical structures. The CBCT images suggest the presence of a vertically impacted mesiodens, with lingual position. The tooth's removal was also in this case required prior to the beginning of prosthodontic treatment *(Fig4)*.

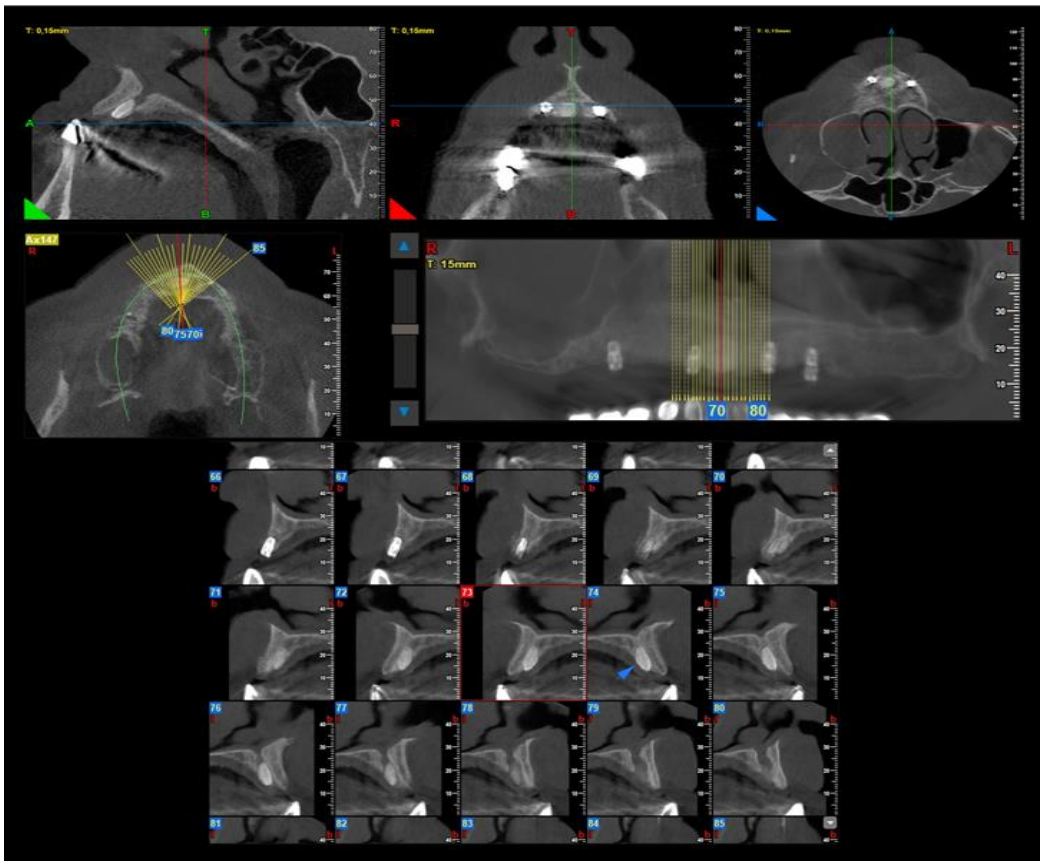

Fig4 *(The CBCT images of the 4th radiological case.)*

DISCUSSION

Supernumerary teeth are a frequent radiographic finding and mesiodens is the most common case. Their prevalence ranges from 0.13 to 2.2% of patients [1, 3, 5, 6]. Supernumerary teeth, and especially mesiodens, are more prevalent among men than women in a proportion of 2 to 2.5:1 [7, 8, 9]. The maxilla presents supernumerary teeth more frequently than the mandible [5].

The etiology of mesiodens still remains unclear [1, 5, 10]. Various theories have been suggested occasionally, but none of them has been proven solely correct [1, 2]. At first, mesiodens teeth were believed to form due to atavism or tooth bud dichotomy, two theories which have not persuaded the scientific community [1, 6, 11]. On the other hand, the hyperactivity of dental lamina and the combination

of genetic and environmental factors are considered possible etiologic factors and the most acceptable theory for the development of a mesiodens [1, 2, 5, 11-13]. Some studies have shown that mesiodens' formation is mainly attributed to genetic predisposition, according to the autosomal dominant or, more rarely, the gender-dependent inheritance pattern [2, 5, 12].

Also, several syndromes are known to provoke the formation of mesiodens. Most usually, such syndromic conditions are cleft upper lip and/or palate, cleidocranial dysostosis and Gardner's syndrome [2, 3, 5, 10, 11]. A not surprising finding is the concomitant occurrence of hypodontia and supernumerary teeth at young patients suffering from Ehlers-Danlos syndrome, Down syndrome or Ellis-van Creveld syndrome [1]. Less frequently, Fabry Anderson's syndrome, chondroectodermal dysplasia, incontinentia pigmenti, Noonan syndrome, Nance-Horan syndrome, Zimmermann-Laband syndrome, and tricho rhino-phalangeal syndrome are being expressed with supernumerary teeth, and more specifically, mesiodens [5, 7, 10].

Mesiodens is usually single and impacted [2]. Among all patients with mesiodens, it is estimated that approximately 70-86% of them have one mesiodens and 15-25% of them have two [1, 2, 6, 9, 12]. Patients with three or more mesiodens are extremely rare clinical cases, with an incidence of less than 1% [1, 2, 7]. Those teeth may be classified according to their chronology, morphology and orientation [4-6, 10]. Chronologically, a mesiodens may be pre-deciduous, similar to permanent teeth, or post permanent, also called as complementary [2]. Regarding their morphological development, one may detect an eumorphic, a conical, a tuberculate, a supplemental mesiodens or an odontome [2, 5, 6, 10]. As far as their orientation is concerned, a mesiodens can be vertically impacted, inverted or transverse [3, 5, 10].

Mesiodens are usually asymptomatic and their detection is a chance finding of radiographic examination [5, 6, 10, 11]. In the literature, it is supported that the earlier a usually impacted mesiodens is discovered, the better the prognosis of the treatment [2, 5, 12, 14]. In this way, future complications may be prevented. In order to successfully diagnose the presence of a mesiodens, as in any other case, the clinician needs to have good knowledge of dental anomalies and the development of primary, mixed and permanent dentition, as well as to conduct a thorough clinical and radiological examination [2, 10].

Indicative signs of mesiodens are a possible asymmetry of the median line, an ectopic eruption or a suspicious retention of one or both maxillary primary incisors for more than expected [2, 5, 11]. However, inspection and palpation in the oral cavity are rarely effective in diagnosing unerupted mesiodens [1]. Therefore, radiology with its precious methods is the main diagnostic tool for mesiodens.

Orthopantomographs, maxillary occlusal and periapical radiographs are recommended to assist in diagnosing mesiodens [2, 4, 10]. They can determine the shape and location of mesiodens, as well as any possible complications provoked by their presence [9]. Panoramic radiograph is the best screening tool, due to its ease and low cost, although its clarity in the midline maxillofacial region does not always allow the successful diagnosis of mesiodens [2, 5]. Also, two-dimensional radiographs often lead to interpretation difficulties, as superimposition and magnification issues are raised [11]. So, they fail to illustrate the exact spatial relationships between mesiodens, the surrounding alveolar bone and the adjacent anatomical structures [6]. For a more precise view in the incisor region, anterior occlusal or periapical radiographs are expected to be more helpful. So, by applying the parallax technique at

intraoral radiographs, the bucco-lingual position of the unerupted mesiodens can be adequately evaluated [2, 5]. Recently, cone-beam computed tomography (CBCT) has also proven to be useful in further investigating the features of an impacted mesiodens, as it provides a three-dimensional image and assists in the exact determination of mesiodens' position, axial angle, shape and relationship with the adjacent anatomical structures [4-6, 10, 11]. CBCT has overcome the disadvantages of classic computed tomography (CT), as its scan time is reduced, the radiographic image is much more accurate and patients are exposed to essentially reduced radiation dose [4, 11, 15].

Even though the presence of an impacted mesiodens may be asymptomatic, such supernumerary teeth can possibly provoke complications to the adjacent teeth, the alveolar bone or even the whole oral cavity [6]. Among the most frequently detected complications, one may observe delayed eruption, crowding, impaction of permanent incisors, malocclusion and occlusal trauma, abnormal root formation, alteration in the path of eruption of permanent incisors, median diastema, formation of cysts, pulp necrosis, dental caries, subacute pericoronitis, persistent rhinosinusitis, intraoral infections and abscesses, fistulae, gingival inflammation, teeth rotation or dilaceration, root resorption of the adjacent teeth or even eruption of incisors in the nasal cavity, ameloblastomas and odontomas [1, 2, 4, 5, 7, 9-12, 14, 16-18].

It is clear that mesiodens, even though asymptomatic in most cases, may lead to severe complications and thus, they should be surgically removed, always considering patient's age, crown direction and most importantly mesiodens' position [1, 2, 11, 19]. Cases where the immediate surgical removal of a mesiodens is highly indicated are [2, 3, 10]:

1. Obstruction or delay of eruption or displacement of adjacent teeth
2. Root resorption of adjacent teeth
3. Rotation of adjacent teeth
4. Interference with appliances used for orthodontic treatment purposes
5. Concurrent occurrence of pathological lesions in the vicinity
6. Inaccessible area for oral hygiene maintenance, thus leading to increased risk of developing dental caries and gingival inflammation
7. Treatment planning for future implant placement in the maxillary anterior area
8. Compromised esthetic and functionality of the patient

However, plenty of patients choose to avoid surgery as long as mesiodens are asymptomatic, which is acceptable on the condition of periodic clinical and radiological evaluation [3, 11]. Cases where the monitoring of asymptomatic mesiodens is acceptable are [2]:

1. Satisfactory orientation of eruption of succeeding teeth
2. Absence of any pathological lesions in the vicinity
3. No risk for the vitality of adjacent teeth
4. No interference with teeth alignment in the dental arch without the need for orthodontic treatment.

The surgical removal of mesiodens may happen early, before 6 years old when the complete root formation of permanent incisors is expected, or later, after permanent incisors are fully developed

approximately at the age of 8-10 [1, 2, 11, 20]. It should be mentioned that the proper eruption and alignment of all teeth of the dental arch require mesiodens' early extraction at an age within the mixed dentition [2]. Nevertheless, there is a wide controversy on the literature regarding the time of intervention in case of a mesiodens [1, 11]. The early surgical management is the treatment of choice, although the final decision is up to the patients and/or their guardians [2]. Early surgical removal of mesiodens prevents from future complications, requires less extensive surgery and minimizes the risk of developing other associated pathologies related to the mesiodens [1]. On the other hand, the late removal of mesiodens includes lower risk of provoking injury and devitalization of the adjacent teeth and/or a possible root malformation [1]. Furthermore, the psychological tolerance of the young patient should be taken in consideration and respected, as the younger the patient the more difficult it is to accept the surgical procedure [1, 5].

When the surgical removal of mesiodens is chosen, surgeons should bear in mind that the surgery should be executed carefully, in order to avoid ankylosis or abnormal eruption of the adjacent teeth [10]. Surgical removals of unerupted mesiodens are usually carried out via a palatal approach [1, 4]. In cases of mesiodens located on the labial side, a vestibular approach can be applied [1]. The advantages of the palatal approach are better surgical field, easy positioning for mesiodens and less cicatricial tissue after surgery, although the gingival papilla may be damaged during flap surgery [4]. But, in the labial approach, surgeons can get larger surgical field and fewer cicatrices after surgery, but it is easier to damage the adjacent normal teeth during bone removal and lead to gingival papilla laceration during flap surgery [4, 7].

The palatal and vestibular approaches are not usually the first choice to remove mesiodens in contact with the cortical bone of the nasal base and/or mesiodens that have erupted into the nasal cavity [1]. In those cases, the modified maxillary vestibular approach can be applied, especially if the crown or root of the mesiodens is situated ventrally from the roots of the upper incisors [3, 7]. This technique offers some advantages in terms of a lower risk of complications and postoperative morbidities, including blood loss, damage to adjacent teeth, surgical wound and bone loss [1]. The advantage of the modified maxillary vestibular approach with subperiostal intranasal dissection versus intraoral palatal approach is lower postoperative morbidity and a lower risk of complications (smaller surgical wound, minimal exposure of maxilla, minimal bone loss, reduced risk of damage to the roots of upper incisors, lower risk of damage to the nasopalatine neurovascular bundle, greater clarity of the surgical field and easier surgery, no need of postoperative palatal splint [3].

CONCLUSION

Surgical removal should be avoided if unerupted supernumerary teeth remain asymptomatic, with some teeth best kept under observation. However, in cases of inverted mesiodens, which tend to move toward the nasal base, the surgical invasiveness of removing the mesiodens is thought to increase with longer observation period. Early detection of mesiodens by routine radiographic check-ups and surgical planning with due consideration of patient age, crown direction, and position of the mesiodens contribute to improved treatment of mesiodens.

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