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Interdisciplinary diagnostics and dental treatment: clinical case report of a 13-year-old female patient

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ABSTRACT

The study was conducted at the Faculty of Dental Medicine, University Medical-Dental Center, Varna, Bulgaria, in 2023, with permission and informed consent from the parents and the patient. Patient K. Vl. Ts., 13 years old from the city of Varna, comes without complaints. The reason for the visit is a desire to consult an orthodontist and start orthodontic treatment. The patient had a hospital stay at the age of 8 due to an operation - adenoidectomy. PLI - Plaque index by Silness and Löe with a value equal to 1.58, which defines oral hygiene as satisfactory to poor. Exogenous prophylaxis was performed. Treatment of plaque-associated gingival inflammation with professional oral hygiene and application of fluoride varnish every 3 months. Treatment of dental caries is operative: Teeth 27, 36, 37, 47 - with caries occlusalis D 2-3, lesions - after minimally invasive operative treatment with a glass-ionomer cement (GIC) placed, a definitive filling was made with photo-composite and sealant application of the healthy pits and fossae of the fissure. Patients and their parents should be trained to practice excellent oral hygiene during orthodontic treatment in order to reduce the risk of developing dental caries.

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1. INTRODUCTION

Back in the 1970s, authors applied the indices of gingivitis to an epidemiological study of gingivitis among schoolchildren. Their observations, with minor differences, have been repeated in numerous studies: the prevalence of gingivitis increases with age; it begins with the temporary dentition and peaks during puberty [1]–[5]. The prevalence, severity, and duration of gingivitis have their explanations: i) increase in the number of local areas of risk in the mouth, the accumulation of plaque and inflammatory changes associated with the breach, and ii) influence of hormonal factors during puberty. It is interesting to know that the peak of gingivitis during puberty does not have an analogous peak in plaque level (social factors) [6]–[10]. Timely interdisciplinary diagnosis and treatment through orthodontic, orthopedic, therapeutic, implantology, and periodontal methods at a modern level, provides optimal conditions for maintaining a healthy periodontium, as well as to improve the aesthetic appearance, which is necessary to improve the quality of life of the patients [11]–[18]. In their study, authors such as Kazeminia *et al*. [19], from a total of 164 articles (81 articles on the prevalence of dental caries in the temporary dentition and 83 articles on the prevalence of dental caries in the permanent dentition), conduct a meta-analysis. The prevalence of dental caries for the temporary dentition in children worldwide with a sample size of 80,405 was 46.2% and the prevalence of

dental caries in the permanent dentition associated with childhood worldwide was 1,454,871 or is 53.8% [19]. The purpose of this study is to apply an interdisciplinary approach of diagnosis and preparatory treatment with prophylaxis in pediatric dentistry to a 13-year-old female patient.

2. METHOD

Case report: history: The history was taken based on the testimony of the patient and his parent (mother). Patient, 13 years old from the city of Varna, was admitted without complaints. The reason for the visit is a desire to consult an orthodontist and start orthodontic treatment accordingly. History of oral diseases: The last examination of the patient was 5 years ago - a preventive examination. Reports the presence of harmful habits - grinding and clenching of the teeth during sleep. At about 6-7 years of age, difficulty breathing through the nose was detected, and after consultation with an otorhinolaryngologist, the patient underwent an operation, following the conclusion that the diagnosis was the cause of the harmful habit. Reported a past head trauma about 5 years ago. There were no missing teeth.

Oral hygiene consists of cleaning the teeth in the morning and in the evening with a manual brush, with medium hardness of the filaments and using a toothpaste - Sensodyne or Colgate. No mouthwash is used. Intake of fluoride came only with the toothpaste. Reported frequent consumption of carbonated beverages between main meals and less frequent consumption of sweets and other simple carbohydrates. General medical history. The patient had a hospital stay at the age of 8 due to an operation - adenoidectomy. The mother did not report any difficulties with the pregnancy and the childbirth, as well as taking medication during pregnancy. The child does not take any medication and has no proven allergies. No general medical illnesses.

Examination: extraoral: no facial asymmetry, no cicatrices, the skin of the face has preserved turgor, visible mucous membranes-no changes, rash units and swellings are not observed. No pathology in the movement of the temporo-mandibular joint and trismus was detected. Intraoral examination: mucous membrane: no pathological changes; gingiva: color: localized redness; texture: smooth; papillae: swollen; gingival margin: swollen, red, thickened. Bite- distal bite (class II, 1 subclass), deep bite. Strongly protruding upper incisors and sagittal distance between the two dental arches (overjet). Palatally inclined upper lateral incisors and rotated premolars. Tongue: uncoated, normal color, rash elements not observed. All of the patients's permanent teeth had erupted (except the third molars), and it is expected that they have completed their root development. We performed and analyzed an oral hygiene index: PLI - Plaque index by Silness and Löe [20]. This index reflects plaque thickness only near the coronal edge. Assessment is by scraping with a probe, without staining. The plaque index of an individual was determined by summing the values obtained for each tooth and calculating the averages. To determine the plaque index, Silness and Löe reference values were taken as a basis: plaque index 0: No plaque is in the area adjacent to the gingiva.

The Silness and Loe Plaque index has a four-point scale: i) Score 0: The tooth surface is clean; ii) Score 1: The tooth surface appears clean, but dental plaque can be removed from the gingival third with a sharp explorer); and iii) Score 2: Plaque is visible along the gingival margin (see Figure 1 and Table 1). Based on the scoring system, plaque index = (2+1+1+2)/4 = 1.5. According to the plaque index system, this means the plaque index for the tooth is moderate accumulation of soft deposit within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye (see Figure 1 and Table 1).

Its value is equal to 1.58, which defines oral hygiene as satisfactory to poor. We applied modern tools for early diagnosis - the ICDAS system [21]. ICDAS and the International Caries Classification and Management System™ (ICCMS™), an international system for the diagnosis, detection, and evaluation of caries lesions as shown in Table 2.

Dental caries diagnosis D3a was found on teeth 36, 17, 27, 37, 46, and 47 tooth with diagnosis dental caries D2. Dental caries D1b was diagnosed on teeth 16, 12, 22, 24, 25. To date, the patient has not had filling placed. Consultation and treatment by an orthodontist are necessary. Consultation with an oral surgeon is also necessary; if necessary, treatment can be carried out by germectomy - by extraction of the impacted 3rd molars (38 and 48).

Table 1. Scale and criteria for scoring the plaque index- PLI - Plaque index by Silness and Löe

PLI - Plaque index by Silness and Löe	Criteria
0	Absence of microbial plaque
1	Thin film of microbial plaque along the free gingival margin
2	Moderate accumulation with plaque in the sulcus
3	Large amount of plaque in sulcus or pocket along the free gingival margin

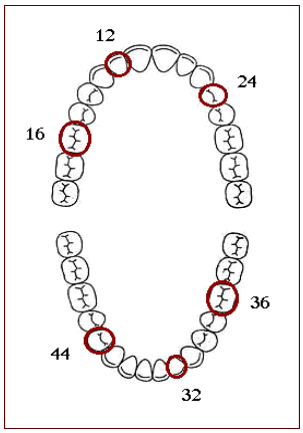

Figure 1. Representative teeth on which the patient's dental plaque accumulation was assessed

Table 2. ICDAS II 15/06/2012

Code	Description
0	No enamel demineralization
1	Enamel demineralization limited to 50% of the enamel thickness and its outer surface
2	Demineralization (brown discoloration) between 50% of enamel and 1/3 of dentin
3	Demineralization (brown coloration) involving the middle third of the dentin
4	Demineralization (brown coloration) involving the inner third of the dentin

3. RESULTS AND DISCUSSION

Malocclusion is a worldwide dental problem. Many risk factors contribute to dental abnormalities, including hereditary ones. Dental caries, pulpitis and periapical inflammations, traumatic injuries, developmental abnormalities, and oral habits are the most common oral diseases in children that are strongly associated with malocclusion [22]. The patient is at high caries risk - presence of active white caries lesions, presence of plaque on the teeth, poor oral hygiene, and not regularly visiting as shown in Figure 2.

Sá-Pinto *et al.* [23] evaluate the scientific results regarding the relationship between malocclusion and dental caries in adolescents. Orthodontic treatment is thought to increase the risk of dental caries. The goals of orthodontic treatment in patients with malocclusion are to improve the esthetics of the maxillofacial region and to optimize masticatory function by changing the position of the teeth [24], [25]. Orthodontic treatment is associated with a reduced likelihood of a dental caries. Furthermore, there is no evidence showing a relationship between the outcome of carious teeth and orthodontic treatment [26]. Authors such as Seiffert *et al.* [27], conducted a scientific study evaluating the quality of clinical practice guidelines for the prevention of dental caries in children and adolescents.

The tooth germ of the four permanent third molars, in the stage of formation of the dental crown, are laid, and those of the lower jaw have a probable prognosis of staying retained or difficult eruption. The tooth germ of the four third molars, in the stage of formation of the dental crown, are laid, and those of the lower jaw have a probable prognosis of staying retained or difficult eruption. X-ray status: Orthopantomography (OPG) was performed for diagnostic purposes and its quality was satisfactory. Root development of the teeth is complete, without the third molars as shown in Figure 3.

Treatment plan: Motivation and education to improve the oral hygiene is provided. Treatment for reducing the plaque on the teeth-the induced gingival inflammation-professional oral hygiene application of fluoride varnish every 3 months. Treatment of the reversible lesions with tooth mousse for a period of 7 months every night after oral hygiene with the application of the cream on the dry enamel surfaces. The child does not wash off the cream afterwards. A carious process was established-presence of carious process indicators-active enamel lesions, presence of dentin cavitated lesions. Treatment begins with the determination of the active, the stationary lesions, the reversible, and the irreversible lesions. The active lesions are located under the plaque, in areas for the development of caries, the lesion has no clear boundaries, it is rough, without transparency and without a shine, and the color is white. Inactive lesion-in atypical areas, lack of a plaque, with clear boundaries of the lesion, has a shine, transparency, smooth, color - white to brown. Active carious lesions require non-operative or operative preventive treatment. Inactive lesions do not require treatment. Reversible lesions are D1a, D1b, and D2. They require non-operative preventive treatment. In case of irreversible lesions, it is necessary to carry out operative treatment, preceded by non-operative ones.

Figure 2. Photo documentation of the patient's primary examination, determination of the dental status

Figure 3. Orthopantomography (OPG) of the patient's permanent dentition, performed para-clinical examination

A differential diagnosis between a deep fissure and occlusal caries is necessary. All of the molars erupt with deep fissures. Fissures are maturing last and their mineralization is the weakest (post-eruption maturation lasts up to 10 years after eruption). The enamel in the area of the deep fissures is extremely thin. Plaque formation is enhanced and unobstructed-easy entry of food residues and microorganisms. Plaque in the fissure cannot be affected by the self-cleaning mechanisms in the mouth. A permanent cariogenic situation is created, which does not allow post-eruption remineralization. Fissure caries develops in many occlusal areas because the fissures and pits on the occlusal surface of the newly erupted tooth are much more than those in the adult individuals (highly detailed texture). The entrance of the deep fissure is narrowed, and an extension exists below it. A toothbrush is unable to penetrate deep into these tight spaces. Even the single bristle of the toothbrush is too large to enter and clean the fissure. Protection of these fissures is achieved by application of sealants. In order to make a successful differential diagnosis, it is necessary: direct observation, additional studies, indirect data, and establishing the presence of caries risk factors.

The following was performed: operative treatment of dental caries: Tooth 27 - with occlusal caries, lesion D3b - in the distal fossa. Operative treatment with a minimally invasive technique and a calcium dihydroxide dressing, a glass-liner pad (GIC), and definitive filling with photo-composite were applied. Tooth 37- caries oclusalis D2, performed minimally invasive operative treatment and filling with photo-composite. Subsequent application of sealants of healthy fossae, fissures, and pits. We set the end of treatment: definitive filling with photocomposite materials: Tooth 36 with D3a occlusal caries, after a minimally invasive operative treatment, a glass-liner support was placed and obturation with photo-composite and application of sealants of the healthy occlusal pits and fossae on the occlusal surface of the fissure (definitive obturation class 1); tooth 47 oclusalis caries D2 – after minimally invasive operative treatment and filling was made with photo-composite and application of sealants of the healthy pits and fossae of the occlusal fissure (definitive filling class 1). Application of a sealant on the healthy pits and fissures; tooth 36 with a carious lesion D3a on the occlusal surface – a support was made of glass liner (GIC) and filling with photo-composite, after which a sealant was applied to the healthy pits and fissures as shown in Figure 4.

Figure 4. Tooth 37 with a D2 carious lesion on the occlusal surface, after micro-invasive operative preparation of a cavity, a definitive filling with photo-composite was made

Direct observation includes: Visual observation - requires good lighting, drying and clean teeth. Any calculus deposition or presence of a plaque should be cleaned before examination, and the fissure may be stained with food pigments. Tactile inspection using an atraumatic probe. Aggressive probing should not be used because it may damage the superficial enamel layer and initiate an incipient carious lesion. Retention of the probe in the fissure may result in a false positive or negative result. Early childhood oral health management is performed in the pediatric dental clinics [28]–[30] to minimize the adverse impact of these diseases on the teeth [31]–[33]. In recent years, there has been a significant increase in the number of patients and/or parents seeking orthodontic treatment due to a number of psychosocial and esthetic improvements, not only due to functional abnormalities [34]–[41]. Health indicates the degree of functional and psychological integrity of the organism. Many authors in this field have found that oral health is directly related to the patient's systemic condition in childhood up to 18 years of age [42], [43]. From our available literature, we found that there is an increase in the need for orthodontic treatment in a large number of different cases of patients visiting dental clinics [44]–[47]. There is also a need for proper planning in order to provide timely, orthodontic services both at the individual level in the dental clinic and at the level of groups of children and to assess the need for resources and methods of providing treatment techniques [48].

4. CONCLUSION

Patients and their parents should be trained to practice excellent oral hygiene during orthodontic treatment. Oral health care is also important to reduce the risk of developing dental caries. Further studies are needed to show a relationship between orthodontic treatment and the probability of treatment of new carious lesions. Patients need regular preventive examinations and treatment in the dental clinic every 3 months or 4 times every year.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors declared no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The study is authorized by the Commission for Ethics of Scientific Research at Medical University of Varna with protocol-decision No. 40/30.10.2014, and was conducted at the Faculty of Dental Medicine, University Medical-Dental Center, Varna, 2023, with permission and informed consent from the parents and the patient.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [DMD], upon reasonable request.

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