

Clinical and therapeutic aspects in dento-alveolar disharmony (DAD) with crowding

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ABSTRACT: Dento-alveolar disharmony (DAD) with crowding represents a predispose factor for periodontal pathology installing, especially when septic inflammation is associated. In this context, the identification of integrity or presence of the periodontal structure modifications becomes essential, any discovered element of periodontal pathology transforming into an important factor for a correct and beneficial orthodontic or periodontal-orthodontic therapy setup. The purpose of our study was to reveal the relations between the DAD existence and periodontal modifications within a lot of 528 subjects of 7 to 19 years old wearing different DAD who asked for an orthodontic control, and also the effects of orthodontic therapy upon periodontal structures for the situations in which this therapy was instituted. 74,87% was the percentage for patients with DAD and crowding who accepted the initiation of an orthodontic treatment and 12,75% of them had a friable C type periodontium (with great possibility to evolve towards a periodontal pathology), 25,62% had chronic gingivitis, and in 15,43% there have been noticed gingival recessions more than 2 mm. The orthodontic treatment was finalized for 44,96% of the patients, in 13,43% we noticed the persistence of C type periodontium, in 8,95% of gingival recessions more than 2 mm, in 25,37% chronic gingivitis and in 22,38% hypertrophic gingivitis.

Conclusion: it is important to initiate an exhaustive control of the patient with DAD before, during and after the orthodontic treatment, especially if the patient is susceptible to develop a periodontal pathology, and also to maintain a good oral hygiene along the treatment.

KEY WORDS: Dento-alveolar disharmony (DAD) with crowding; periodontal modifications; inflammation; orthodontic treatment.

Introduction

DAD with crowding represents a predispose factor for the onset of periodontal pathology, especially when septic inflammation is associated, because the disproportion between mesial-distal dimensions of permanent teeth and alveolar arches perimeter leads first of all to diverse dental malpositions (ectopy, rotation, inclusion) localized at incisive-canine regions, and secondly to numerous retentive sites for food rests and bacterial plaque that are difficult to remove through self or artificial cleaning [1-3]. Recent studies reconfirmed that this predisposition is not invariably followed by developing a periodontal pathology (no matter for its type - gingival overgrowth, gingival recession, chronic marginal periodontitis), especially if the patient respects the instructions regarding the oral hygiene procedures [4,5].

Teeth in malpositions are the subject for non-axial occlusal burdens that can generate lateral

harmful forces for support periodontal structures [6].

Another issue raised by this anomaly is represented by the fact that malpositioned teeth do not always erupt into the band of attached gingival, being able to erupt also into the oral mucosa [6] and even the tooth is aligned afterwards into the arch, a deficient, thin periodontium will structure on its vestibular side, considered to be a risk factor for the future mucosal and gingival problems.

The correct periodontal-orthodontic treatment planning will allow important dental movements, even in patients with dimensional reduced periodontium if the movements respect genetic determined bone limits. Some authors consider that the orthodontic dental movement represents an alternative method for bone regenerate inducing and gingival biotype regeneration [7] and that short and long term results of the orthodontic treatment actually

reflect the efficiency of orthodontics-periodontology collaboration [8].

Material and method

The study was achieved between 2008 and 2012 on a lot of 528 patients of 7-19 years old, presenting different dento-maxillary anomalies and asking for orthodontic treatment. The purpose of this clinical study was: to reveal the role of dento-alveolar disharmony (DAD) with crowding as a contributory factor in inducing chronic marginal periodontitis, by maintaining the inflammation at periodontal level (facilitating plaque gathering), by changing the intensity and direction of occlusal forces with gingival contour and/or alveolar bone architecture changing; to indicate the role of orthodontic treatment onset in children and adolescents by preventing the apparition of periodontal modifications or for the healing of existing periodontal modifications. From the mentioned lot there have been selected the cases we considered to be suggestive, in order to indicate and evaluate the influence of DAD with crowding. To establish a correct diagnosis and an adequate orthodontic, periodontal-orthodontic treatment plan, the clinical exam of the patients was completed by radiological exams: ortopantomographies (for orthodontic and periodontal diagnose), profile or front teleradiographies (for orthodontic diagnose and treatment).

Results

Of the 528 consulted patients, 322 were female, representing 61% and 206 were male, representing 39%.

The dento-maxillary anomalies analyze (respecting the syndrome classification of the German school) showed that the dento-alveolar disharmony (DAD) with crowding was met in about 38% (199/528) (chart 1).

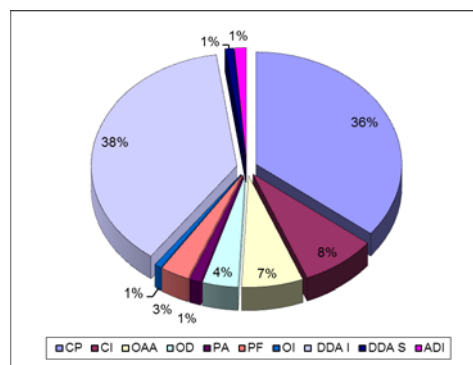


Chart 1. Patients distribution regarding the dento-maxillary anomaly

Legend: AnDMAN-dento-maxillary anomaly; ADI-isolated dental anomalies (single cause); CP-maxillary compression syndrom with protrusion; CI- maxillary compression syndrom with crowding; OI-crossbite; OD-open occlusion syndrom; OAA-deep bite syndrom; PA-true progenic syndrom; PF- false progenic syndrom; DDA-dento-alveolar disharmony

Table 1. The distribution of subjects with DAD depending on the initial periodontal status

DAD (total no. 204/528)	No.	Percent (%)	C type, thin marginal periodontium		Elements of periodontal pathology				
					Gingivitis		Gingival recessions (≥2mm)		Aggressive marginal periodontitis starting at young age
			No.	Percent (%)	No.	Percent (%)	No.	Percent (%)	
With crowding	199	37,66	26	13,0653	51	25,62	29	14,57	1
With spacing	5	0,93	2	40	2	40	1	20	1

The percentage of patients with DAD and crowding who accepted an orthodontic treatment starting was 74,87%, 12,75% of them presented a C type friable periodontium (fig. 1,2),

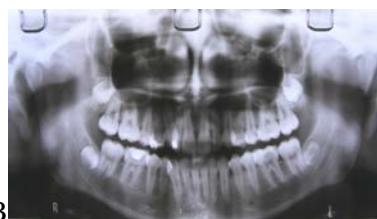


Fig.1. P.M. ♀, 14 years old: a) intraoral - friable fine C type periodontium at low anterior teeth group; b) ortopantomography indicates the deletion of interdental alveolar septa tops from 3.2 to 3.5

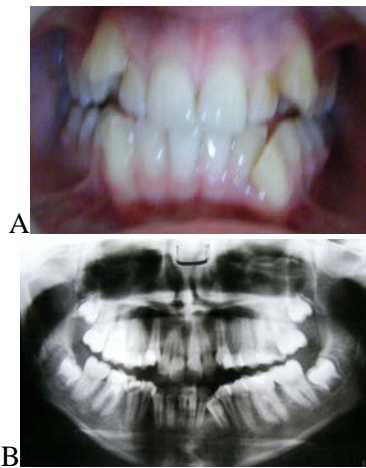


Fig.2. N.M., ♀, 14 years old:
 a) intraoral - the alveolar bone around the ectopic canines is thin; swollen and reddish-violet colour of the interdental papilla between 3.2-3.3, because of the compression made by ectopic 3.3;
 b) orthopantomography indicates the absence of lamina durra between 3.2-3.3 and 2.2-2.3

in 15,43% there have been noticed gingival recessions more than 2mm (fig.3),



Fig.3.S.M., ♂, age 12 – gingival recession of 2 mm at 4.1 with tartar deposits on vestibular side of lower central incisors; interdental papillae between 4.1-3.1 and 3.1-3.2 with lobulated aspect, with superior mamelonated part

and 27,51% presented chronic gingivitis (fig.4).



Fig.4. G.C., ♂, 10 years old –simple chronic gingivitis, interdental papillas with swollen aspect

At the end of the study, 55,04% of the patients were in different stages of treatment, and for 44,96% the treatment was finished. Data regarding the noticed periodontal modifications are presented in table 2.

Table 2. The periodontal status of the patients with DAD who supported an orthodontic treatment or are still under the treatment

Orthodontic treatment	DMAn		Periodontal status												
	Type	No	No modifications		C type periodontium		CG		HG		GR (≥2mm)		Gingival folds		
			Nr	%	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%	
	DDA	İ	149	83	55,704	19	12,751	41	27,516	0	0	23	15,436	0	0
		S	3	0	0	1	33,33	1	33,33	0	0	1	33,33	0	0
Ended	DDA	İ	67	25	37,31	9	13,432	17	25,373	15	22,388	6	8,955	5	7,462
		S	0	0	0	0	0	0	0	0	0	0	0	0	0
Not ended (intermediate state)	DDA	İ	82	37	45,12	4	4,878	23	28,04	9	10,97	11	13,41	0	0
		S	3	0	0	2	66,66	1	33,33	0	0	1	33,33	0	0

Legend: DMAn-dento-maxillary anomalies; DAD-dento-alveolar incongruence syndrome, C with crowding, S with spacing; CG-chronic gingivitis; HG-hyperplastic gingivitis; GR-gingival recessions

There can be noticed that from the patients that are still receiving treatment, 28,04% present chronic gingivitis (fig. no.5), 13,41% gingival recessions and 10,97% gingival overgrowth (fig.6).



Fig.5.S.M., ♂, after 1 year of treatment at age 13 - simple chronic gingivitis

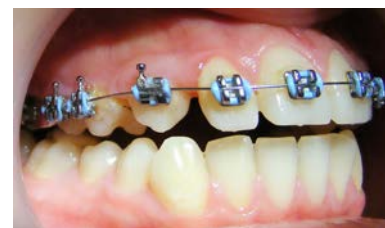


Fig.6. P.M. ♀, after 1 and ½ years of treatment at the age of 15 and ½ – hypertrophy of gingival papillae at 1.4-1.1, 4.1-4.3

For patients whose orthodontic treatment was finalized, the percentage of patients with maintenance of C type periodontium was 13,43%, of those with gingival recessions more than 2 mm of 8,95%. Gingival overgrowth was noticed in 22,38% of

the cases (fig. no.7), and gingival folds appeared in 7,46% of the cases (fig. no.8).

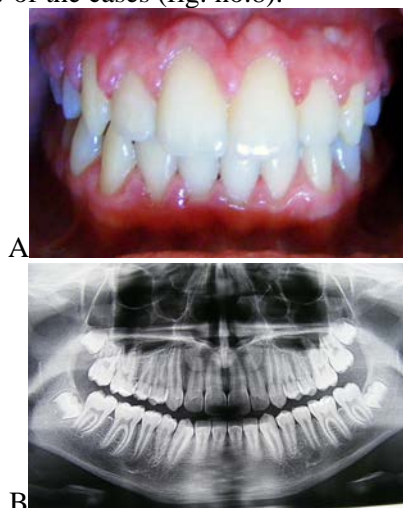


Fig.7. G.C., ♂, after 2 years of treatment, at age 12 –a) intraoral - upper central incisors present discrete marginal gingival recessions "V" type and gingival hypertrophy bimaxillary; b) orthopantomography indicates an easy flattening of the interdental septa between upper incisors and a reduction of bony cortical density between 1.1-2.1

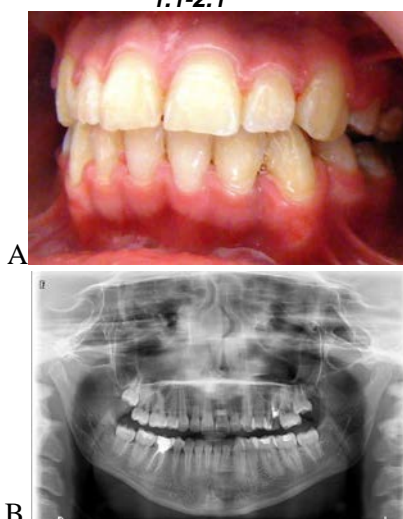


Fig.8. N.M., ♀, at 16 and ½ years old, after 2 and ½ years of treatment – a) intraoral - gingival fold between 3.5 and 3,3 and the presence of interdental papillae hypertrophy between upper canines and second premolar, b) orthopantomography does not indicates structural modifications of the alveolar bone

Discussions

The dento-alveolar incongruence correction after the orthodontic treatment in similar case as the ones before, may offer a bigger opportunity to these patients for a normal development of the periodontium by removing the occlusal interferences and by facilitating the oral cavity sanitization [10], beside the obviously aesthetic benefits.

The implications of DAD with crowding presence over the periodontal architecture are multiple. Most frequent it appears a C type periodontium after Korbendau and Guyomard (1992) [9], where the alveolar process is thin, the gingival edge is away from the ivory-cementum connection, with a 2 mm dehiscence, the gingival tissue is thin and tense, 2 mm high. Such type of periodontium may determine a gingival recession or a root denudation on teeth in vestibular-position (especially the central incisor, the lateral ones more rarely), due to the exceeding of the anatomical limits of the arches [11, 12]. Around the teeth in vestibular-position, the alveolar bone is thin, sometimes with a dehiscence, the gingival ditch is less profound, and the resistance at mechanical stress during dental brushing is reduced [11]. A development happens towards inside of the alveolar mucosa for the teeth in vestibular ectopy (especially the canines). The explanation for this phenomenon is the impossibility of intrabony migration of the canine crown toward palatine side, behind the lateral incisor root, as a result of the lack of space.

When DAD treatment implies extraction for first premolars to gain necessary space for arches alignment, the canine recoil to the space obtained after extraction may lead to gingival invaginations or folds. After Robertson et al. (1977) [13] the canine recoil is followed at 35% of the patients by a gingival fissure, through epithelial invagination, resulting an interdental string point at the scar extraction site. In 70% of the cases it will generate a simple ditch or a vestibular fold at the edentulous crest [14]. Botero et al. (2004) [15] showed that the canine recoil should take place slower and along a short distance if the patient has a thin periodontium, in order to prevent the negative effects. The ditches and folds can reduce or completely disappear with time [16].

Many of the harmful periodontal effects may be associated with the bacterial plaque accumulation because of the difficulty in maintaining a good oral hygiene in the presence of fix orthodontic appliance [17,18]. After Pozo and colab. 2011 [19], the onset of gingival inflammation after orthodontic appliances mount, especially the fix ones, unfortunately is a common thing, and the plaque accumulation on the fix orthodontic appliances components represents a way of destroying the periodontal tissues [20].

Another frequent problem noticed during orthodontic treatment, especially with fix

appliances is the gingival overgrowth (hypertrophy and hyperplasia) [21]. The initiation and development of these gingival hypertrophies may be the cause of periodontal pathogens from the bacterial film on orthodontic appliance components and of the inflammatory cytokines release (tipul IL-1 β and TGF- β 1) during orthodontic dental moves [22].

In most of the cases the gingival inflammations and hypertrophy are often transitional; they usually disappear in a few weeks after removing the fix orthodontic appliance [23].

Conclusions

1. The qualitative and quantitative evaluation of the sustaining tissues of the dental organ is essential, because this allows the patient integration in a therapeutic schedule adapted to periodontal morphology and to expected orthodontic and/or orthopaedic moves.

2. During the orthodontic treatment, a moved tooth along its alveolar process to sites with thin gingival and inflammation presents a high risk of marginal gingival recession appearance; space closure after extraction may also be accompanied by periodontal modifications, gingival invaginations and ditches.

3. An ideal leaning of the teeth gained after treatment is followed by the establishment of some correct contact points, a modelling of interdental septa and papillae morphology, also of a new marginal gingival outline.

4. If bad hygiene, the orthodontic appliances will predispose the patient to a reaction gingival overgrowth (hyperplasia or hypertrophy), characterized by papillary turgescence.

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