Abstract

Introduction. In adolescents and young people, the first permanent molar has the longest functioning period, comparatively with the other permanent teeth from the molar-premolar region, the actual epidemiological studies evidencing their highest vulnerability to fissural or proximal caries. In the absence of well-established strategies aimed at maintaining these molars on their arches, their precocious extraction is usually performed, which induces severe occlusal-articular disequilibrium, alteration of the temporo-mandibulary articulation and favorization of various periodontal diseases. Materials and method. The objective of the present study was to evaluate the odontal status and the level of carious affection and, by the complications thus induced, of the extent of affection of the first permanent molar in young people with ages between 16-20 years, as based on the clinical diagnosis criteria of the dental caries, along with the evaluation of its activity according to Nyvad indices. Results. The obtained results show that application of such an evaluation method assures a more complete and correct analysis of the affection extent of the odontal status of the first permanent molar, along with tracing even the incipient lesions and consequently their non-invasive subsequent treatment. Conclusions. A precocious caries diagnosis and, implicitly, a correct evaluation of its activity, represent essential steps for a correct establishment of the main – either invasive or non-invasive – treatment requirements, through remineralization, as part of the carious disease management, which is perfectly valid for the first permanent molar, as well. Keywords: first permanent molar, evaluation, diagnosis, caries

INTRODUCTION

The extent of affection, through caries, of the first molars, occurring during the mixed dentition period has been demonstrated, in epidemiological studies, (1, 2) in ratios exceeding 87% in patients with high cariogenous risk. The presence of either non-cavitary or cavitary caries at the level of the first permanent molars is indicative of the carious activity of each subject in part. Despite the decline registered – in countries in which efficient preventive and treatment measures are currently applied – in the manifestation of the carious disease, it was observed that 90% of the existing caries are localized in ditches and fossae, the most affected among the permanent teeth being the first molars (3, 4). That is why, the carious processes occurring at these molars are, in most clinical situations, acute, with a rapid evolution, causing, within quite short time intervals, destruction of the masticatory surfaces and of the contact points, thus favorizing severe local, local-regional or general complications (5-10). In the absence of precise strategies aimed at preserving the molars on the arches, precocious extractions are performed and serious occlusal-articular disequilibrium (11) occur, affecting the temporo-mandibulary joint and favoring manifestation of various periodontal diseases (12, 13). Most of the national epidemiological studies controlling the prevalence of caries include exclusively the carious lesions with visible cavitation (14).

In 1999, Nyvad B. et al. proposed new clinical criteria for caries diagnosis, including both cavitary and non-cavitary caries, on considering, too, the activity of the carious lesions. Not always the incipient caries of the enamel develop cavitation, as they may be subjected to a remineralization therapy (15) through which their evolution is stopped. The modern diagnosis of the carious disease, including the activity degree of the caries and the incipient evolution stages is very important, becoming essential in planning, monitoring and appreciating the efficiency of the treatment applied and the possible need for a subsequent treatment. This is especially valid for the first permanent molars, which are the first permanent molars to erupt and are the ones with the longest lifespan,

THE ODONTAL STATUS AND CARIOUS AFFECTION LEVEL OF THE FIRST PERMANENT MOLAR IN 16-20 YEAR-OLD ADOLESCENTS – A CLINICAL STUDY

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ciency of the applied prophylactic and therapeu-
tical measures (16,17).

THE AIM OF THE STUDY

The study evaluates the odontal status, the
level of carious affection and its complications
in the first permanent molar in young people,
with ages between 16-20 years, who came to a
medical dentistry surgery in Galați between
2008-2010, on the basis of clinical criteria for the
diagnosis of the dental caries, for estimating the
extent of its activity.

MATERIALS AND METHOD

The experimental group included 96 youths,
boys and girls, with ages between 16-20 years,
selected from the persons having come to the
private medical surgery, 1st year students of the
University of Galați, to whom a free-of-charge
examination was offered.

The criteria for their inclusion in the experi-
mental group were the following: a large range
of diagnosed odontal pathologies, among which
affection, through caries, or even premature loss,
following some post-carious complications of
the first permanent molars; age between 16 and
20 years; informed consent was obtained from
the patients.

The exclusion criteria referred to non-cooperant
patients, with ages under 16 and over 20 years.

The investigations observed the legislation in
force in Romania and the deontological norms,
namely Law 46/January 21, 2003, establishing
the rights of the patient, following his consent
for scientific experiments. Also, the privacy of
the personal records was granted. The purpose
and stage of development of the study was ex-
plained, after which informed consent was
signed by the patients. The experimental group
(n = 96) included:
- 46 boys and 50 girls with ages between 16-
20 years;
- 57 persons came from the urban area, and
39 from the rural one.

Clinical examination was performed in the
desintistry surgery, under optimum confort con-
ditions, and adequate light, by means of the clas-
sical medical kit (probe, clip and mirror), special
attention being paid to the morphology and to
the affected dental structures. The evaluation
included:
1. calculation of the bacterial plaque index,
OHI-S,
2. settlement of the carious affection level
and of its complications in the first per-
manent molar was evaluated by a clinical
method of dental caries diagnosis, applied
according to the Nyvad B indices.

The activity of the carious lesions was evalua-
ted on all surfaces (vestibular, oral, mesial,
distal, occlusal) of the examined teeth, their
translucence, colour and texture being assessed,
as well as the integrity and structure of the in-
vestigated surfaces (intact surfaces, loss of integ-
rency in the enamel defect, presence of a cavity in
dentine) (Tab.1).

Diagnosis criteria according to Nyvad indices
Evaluation of the oral hygiene status involved
calculation of the index of bacterial plaque,
OHI-S .

RESULTS

The obtained data, recorded in the observa-
tion sheet, were statistically processed and
analyzed with the SPSS 17 and EXCEL 2007 pro-
grams. The results thus obtained were employed
for the development and optimization of future
investigations devoted to the prophylactic and
therapeutical aspects of the pathology of the cari-
ous disease and of some premature losses of the
first permanent molars.

1. Distribution of cases as a function of the
medium from which they come evidences their
predominance in the urban area (75%) (Fig. 1).
Distribution of patients as a function of sex reveals a slight predominance in girls versus boys (Fig. 2).

Fig. 2. Distribution of cases as a function of sex

Distribution of patients as a function of age (Fig. 3).

Fig. 3. Distribution of cases as a function of age
Analysis of results according to the index of oral hygiene, OHI-S, gives an average value of 2.86±0.46, corresponding to an unsatisfactory oral hygiene.

A total number of 96 patients was examined, respectively 384 teeth (first permanent molars), 1920 surfaces (O - occlusal side, M - mesial side, D - distal side, Or. - oral side), to which codes varying from K0 to K10 had been assigned, the following observations being made (Table 2):

- Only 113 teeth (565 surfaces) (29.4%) – received code D0 – healthy surface.
- 89 teeth (445 surfaces) (23.177%) – received code D10 (post-caries extracted).
- 182 teeth (910 surfaces) (47.395%) – received codes from D1 to D9, being affected by:[Table 2]

<table>
<thead>
<tr>
<th>Codes distribution on surfaces</th>
<th>Teeth</th>
<th>Surface</th>
<th>% of 1920</th>
</tr>
</thead>
<tbody>
<tr>
<td>113 teeth (565 surfaces) (29.427%) - received code D0 – healthy surface</td>
<td>113</td>
<td>565</td>
<td>29.427</td>
</tr>
<tr>
<td>89 teeth (445 surfaces) (23.177%) - received code D10 (post-caries extracted)</td>
<td>89</td>
<td>445</td>
<td>23.177</td>
</tr>
<tr>
<td>182 teeth (910 surfaces) (47.395%) - received codes from D1 to D9</td>
<td>182</td>
<td>910</td>
<td>47.395</td>
</tr>
<tr>
<td>active non-cavity caries D1 - 106 surfaces (5.520%)</td>
<td>106</td>
<td>5.520</td>
<td></td>
</tr>
<tr>
<td>active cavity caries in the enamel D2 - 125 surfaces (6.510%)</td>
<td>125</td>
<td>6.510</td>
<td></td>
</tr>
<tr>
<td>active cavity caries in dentine D3 - 211 surfaces (10.989%)</td>
<td>211</td>
<td>10.989</td>
<td></td>
</tr>
<tr>
<td>inactive non-cavity caries D4 - 82 surfaces (4.270%)</td>
<td>82</td>
<td>4.270</td>
<td></td>
</tr>
<tr>
<td>Inactive cavity caries in the enamel D5 - 24 surfaces (1.25%)</td>
<td>24</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>inactive cavity caries in dentine D6 - 8 surfaces (0.416%)</td>
<td>8</td>
<td>0.416</td>
<td></td>
</tr>
<tr>
<td>obturation (healthy surface) D7 - 94 surfaces (4.895%)</td>
<td>94</td>
<td>4.895</td>
<td></td>
</tr>
<tr>
<td>obturation (with an associated active caries) D8 - 182 surfaces (9.479%)</td>
<td>182</td>
<td>9.479</td>
<td></td>
</tr>
<tr>
<td>obturation (with an associated active caries) D9 - 78 surfaces (4.062%)</td>
<td>78</td>
<td>4.062</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL= 384 1920 100% D0-D10**
o active non-cavitary caries D1, - 106 surfaces (5.5%)
o active cavitary caries in the enamel D2, - 125 surfaces (6.5%)
o active cavitary caries in dentine D3, - 211 surfaces (10.9%)
o inactive non-cavitary caries D4, - 82 surfaces (4.27%)
o inactive cavitary in the enamel D5, - 24 surfaces (1.25%)
o inactive cavitary in dentine D6 - 8 surfaces (0.41%) or by its consequences (restorations – with or without the presence of some active or inactive associated caries):
o obturation (healthy surface) D7, - 94 surfaces (4.89%)
o obturation (with an active caries associated) D8, - 182 surfaces (9.47%)
o obturation (with an inactive caries associated) D9 - 78 surfaces (4.06%).

• if considering localization, there prevailed the extractions (D10) at inferior molars (teeth 3.6, 4.6) (12.14%), comparatively with the superior ones (1.6, 2.6) (10.93%).
• The most affected by caries, too, (D1-D6) were the inferior molars (teeth 3.6, 4.6) (14.96%), comparatively with the superior ones (1.6, 2.6) (14.27%).
• Deep caries with pulpar affection D3 (1.6, 2.6) comparatively with the inferior teeth (3.6, 2.6) (Tab. 3, Fig. 5);

Table 3

<table>
<thead>
<tr>
<th></th>
<th>1/6</th>
<th>2/6</th>
<th>3/6 4/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>D3</td>
<td>133</td>
<td>78</td>
<td></td>
</tr>
</tbody>
</table>

 Comparatively, the ratio of active cavitary caries is of 6.92% for the upper molars, versus 4.06% in the case of lower molars.
• D7 obturations at the upper teeth (1.6, 2.6) comparatively with the lower teeth (3.6, 2.6) (Tab. 4., Fig. 6.)

Table 4

<table>
<thead>
<tr>
<th></th>
<th>1/6</th>
<th>3/6 4/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>D7</td>
<td>47</td>
<td>47</td>
</tr>
</tbody>
</table>

 Fig. 5. Distribution of code D3 versus localization: upper teeth 1.6, 2.6 or lower teeth 3.6, 4.6.

 Fig. 6. Distribution of code D7 versus localization: upper teeth 1.6, 2.6 or lower teeth 3.6, 4.6.

• A comparison among the incipient non-cavitary enamel caries D1 and the cavitary ones in enamel and dentine D2, D3 leads to the following observations (Tab. 5):
Table 5. Extent of disease through D 1, D 2, D 3, D 4, D 5, D 6

<table>
<thead>
<tr>
<th>Code</th>
<th>1/6</th>
<th>2/6</th>
<th>3/6</th>
<th>4/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>30</td>
<td>1.56%</td>
<td>76</td>
<td>3.96%</td>
</tr>
<tr>
<td>D2</td>
<td>54</td>
<td>2.81%</td>
<td>71</td>
<td>3.7%</td>
</tr>
<tr>
<td>D3</td>
<td>133</td>
<td>6.92%</td>
<td>78</td>
<td>4.06%</td>
</tr>
<tr>
<td>D4</td>
<td>47</td>
<td>2.44%</td>
<td>35</td>
<td>1.82%</td>
</tr>
<tr>
<td>D5</td>
<td>6</td>
<td>0.31%</td>
<td>18</td>
<td>0.94%</td>
</tr>
<tr>
<td>D6</td>
<td>4</td>
<td>0.208%</td>
<td>4</td>
<td>0.208%</td>
</tr>
</tbody>
</table>

• D1 of 1.56% on the upper molars and of 3.96%, respectively, on the lower ones.
• The ratio is maintained for D2, as well, 2.81% for the upper molars and 3.7%, respectively, for the lower ones.
• As to D3, a ratio of 6.92 is found for the upper molars, and of 4.06%, respectively, for the inferior ones.

On the whole, the following distribution was obtained as to:
• The extent of disease through D 1, D 2, D 3 (Tab. 6, Fig. 7):

Table 6. Extent of disease through D 1, D 2, D 3.

- active non-cavitary caries D1 – 106 surfaces (5.520%)
- active cavitary caries in the enamel D2 – 125 surfaces (6.510%)
- active cavitary caries in dentine D3 – 211 surfaces (10.989%)

Fig. 7. Percent distribution of the codes of lesions D1, D 2, D 3.

• Extent of disease through D 4, D 5, D 6 (Tab. 7, Fig. 8):

Table 7. Extent of affection through D 4, D 5, D 6

- inactive noncavitary caries D4 – 82 surfaces (4.270%)
- inactive cavitary caries in the enamel D5 – 24 surfaces (1.25%)
- inactive cavitary caries in dentine D6 – 8 surfaces (0.416%)

Fig. 8. Percent distribution of the codes of lesions D4-D6

• As to the distribution of the D3 lesions situated on the O (occlusal) sides, comparatively with sides M, D (mezial, distal) and D7 situated on the O (occlusal) sides, comparatively with sides M, D (mezial, distal), the following distribution was obtained (Tab. 8., Fig. 9, 10):

Table 8. Distribution of lesions D3

<table>
<thead>
<tr>
<th>Code</th>
<th>1.6</th>
<th>2.6</th>
<th>3.6</th>
<th>4.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>D3 O</td>
<td>39</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>D3 M</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>D3 D</td>
<td>38</td>
<td>0</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>D7 O</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>D7 M</td>
<td>1</td>
<td>18</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>D7 D</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Fig. 9, 10. Percent distribution of the codes of lesions D3.  

THE ODONTAL STATUS AND CARIOUS AFFECTION LEVEL OF THE FIRST PERMANENT MOLAR IN 16-20 YEAR-OLD ADOLESCENTS - A CLINICAL STUDY
DISCUSSION

Some recent studies established a series of criteria (18) for assessing the extent of activity of the carious lesions, on the basis of their aspect (if the surface is smooth, glossy, tough – the lesion is inactive/its evolution is stopped); if the surface is chalky and/or rugous, the lesion is active. Such criteria were adopted for reflecting the clinical observation, the fact that the non-cavitary carious lesions do not always develop into a cavity but, in most cases, their evolution is stopped or they get remineralized, as shown by longitudinal studies (19).

An early diagnosis of caries and, implicitly, assessment of its activity, are essential for a correct selection of the treatment, (20) either invasive or non-invasive, through remineralization, for the management of the carious disease (21, 22), which are characteristics wholly valid for the first permanent molar, as well.

Application of the method of lesion evaluation according to the Nyvad indices permitted a more complete and correct analysis of the extent of odontal disease of the first permanent molar, tracing even the incipient lesions, which could be subsequently treated in a non-invasive manner. Consequently:

- As to the affection level D0 (teeth with healthy surfaces), it registered a higher value in women, comparatively with men;
- For all levels of caries affection, from D1 to D3, the number of cavitary lesions in the enamel and dentine was higher in women than in men;
- The present study discusses the diseases caused by premature loss (extraction) of the first permanent molars (code D10) in 23.1% of cases, more involving being the lower molars, comparatively with the upper ones.
- The number of complicated caries is two times higher in the lower molars, comparatively with the upper ones;
- The active caries cover 12.9% of the surfaces, while the inactive ones - only 5.93%;
- The obturations associated with the healthy surfaces represent 4.89%, the obturations with active associated caries - 9.47% and the obturations with inactive associated caries - 4.06%.
- As to localization, the extractions (D10) of the inferior molars (teeth 3.6, 4.6) (12.14%) were more numerous than those of the superior teeth (1.6, 2.6) (10.93%).
- Also, most affected by caries (D1-D6) were the inferior molars (teeth 3.6, 4.6) (14.96%), comparatively with the superior ones (1.6, 2.6) (14.27%).
- Deep caries with pulpar involvement D3 (1.6, 2.6), comparatively with the inferior teeth (3.6, 2.6);

The authors of a study, performed in 2009 on a group of children from Cluj-Napoca, with ages between 9 and 12 years, evaluated the odontal...
status of the 6 year-old molar and the frequency of the dento-maxillary anomalies in the second phase of mixed dentition, on using index COE (9). In this way, the following results were obtained for the first permanent molar: at 9 years (C=43%, O= 16%, A=10%), and at 12 years (C=24.3%, O=46.3%, A=15.8%). The present study shows an even higher affection level in 16-18 year-old children, the more so that, according to Nyvad, it also permits evaluation of some incipient carious lesions (D1, D 4) and of caries adjacent to restorations (D8, D9) which cannot be included in the evaluation with indices COE. Such elements may be subsequently employed in a more correct, more complete and less invasive therapeutical plan, which will assure a longer life of the molar on the arch.

A similar study, performed in Belorussia according to the Nyvad criteria, showed that, in the 7-10 year group of age, when evaluation was made with code D1, the carious disease was of 92% while, if analysis was performed with code D3, the extent of disease was much lower - of 49% (23).

Application of the new evaluation criteria for carious affection permits its diagnosis as early as its incipient forms, as based on the real situation, thus permitting some prophylactico-therapeutical measures that consider the extent of activity of the carious process, as well.

CONCLUSIONS

The extent of carious disease and its complications in the first permanent molar is quite significant in the 16-20 years group of age. The period as such is an especially critical and difficult one, covering the end of puberty (14-16 years) and the beginning of adolescence (16-20), characterized by a series of both physical (hormonal) and, mainly, psycho-social modifications, by the formation and development of characters, depending on a multitude of factors, all contributing to the formation of the young one’s personality.

All these changes also influence the parameters characterizing the health condition of the first permanent molar which, at this age, is the “oldest” tooth, being present on the arch from the age of 6, so that it is the most exposed one to all cariogeneous factors that may be involved in such a process.

Considering the importance of the first permanent molar in the development of dentition, special stress should be laid on preventive education, so that the patients should come to the dentist’s even prior to the installation of a caries, in a moment in which adequate prevention measures may be taken, together with the application of some modern methods and means for lesion diagnosis in its incipient stages, thus stopping the cavitative process, without any invasive and expensive treatments.

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