NEW DATA ON THE CLINICAL AND THERAPEUTIC MANAGEMENT OF OCCLUSAL CARIES (III)

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Abstract

In the control of occlusal caries, the major challenges are related not only to the detection of non-cavitary lesions, but also to the establishment of the treatment strategies to be subsequently applied. Considering the objective of each treatment, that of helping the patient, it is essential to control the progression of carious lesions by means of non-surgical, preventive/therapeutical methods, whenever necessary. The new strategies applied in caries management are based on the evaluation and predictability of possible risks, a major aspect in the daily taking of therapeutical decisions. The management plan should include: (I) patient’s level of risk, (II) patient’s activity level and (III) severity of the lesion. Various strategies for a most efficient management of patient’s problems, as well as of the carious lesions, have been elaborated by specialized medical organisms, such as: strategies established within ICDAS, CAMBRA, strategies of the caries management system (SMC) and protocols indicated by the system of caries classification according to ADA (American Dental Association). The mission of any new model of caries management is first of all to preserve the dental tissues, and to restore them when only recommended – an idea to guide the decisions of practitioners, starting with the moment of anamnesis, clinical examination and establishment of diagnosis, until the end of the treatment.

Keywords: occlusal caries, clinical management, therapeutical strategies.

The actual objectives in the control of carious disease refer to an as early as possible diagnosis and management of the carious process [1]. Introduction of fluorine as an essential element in the prevention and conservative therapy of the carious lesions led, starting with the ’70-ies, to the modification of caries evolution pattern, reduction of its evolution rate and even to the decline of its prevalence within various populational groups [2-4]. Epidemiological studies demonstrated that, in children and adolescents, the occlusal surfaces appear as the most susceptible sites for caries, in the moment of teeth’ eruption on the arch, the first ones subjected to risk being the first permanent molars, followed by the secondary molars. Contrary to this, the premolars are more rarely affected [5,6]. A recent study has demonstrated that half of the carious experience in 18 year-old children of Denmark was localized on the occlusal surface, even if they represent only 15% of the whole dental surfaces [7]. In young adults, even if the occlusal and proximal surfaces are affected to the same extent, the seriousness of occlusal carious lesions is higher [8].

Unfortunately, the new paradigm of the carious disease, considered as a biological process, induced no significant changes at global level – in relation with either education or dental practice. The mission of any new model of caries management is first of all to preserve the dental tissues, and to restore them when only recommended – an idea to guide the decisions of practitioners, starting with the moment of anamnesis, clinical examination and diagnosis, until the end of the treatment [9].

In the control of occlusal caries, the major challenges are related not only to the detection of non-cavitary lesions, but also to the establishment of the treatment strategies to be subsequently applied. Considering the objective of each treatment, that of helping the patient, it is essential to control the progression of carious lesions by means of non-surgical, preventive/therapeutical methods, whenever necessary [10].
In the year 2003, Ismail et al. [11] synthesized and compared several systems of caries management and classification, all focused on the classification and evaluation of the level of carious lesions’ activity and of the individual caries risk, as well as on the establishment of the diagnosis and elaboration of the treatment plan. These stages may be realized with various strategies. Diagnosis is an important step, as it integrates information provided by the medical, dental and social evaluation, by the detection of the lesion and establishment of its severity, by the evaluation of its activity level, of the individual risk level and also by some additional data, necessary for the elaboration of a therapeutical plan for the patient and for each lesion in part, with the view to preserve the dental structure and to assure oral health [9].

The new strategies of caries management are based on risk evaluation and predictibility, an essential aspect in the daily taking of therapeutical decisions [12]. Evaluation of caries risk starts from the assumption that the carious process is developed mainly in certain individuals or dental surfaces. The risk factors are defined as environmental, behavioral or biological factors which, confirmed by a temporal sequence, usually on longitudinal studies, increase directly – when manifested - the probability of a disease; equally, when absent or eliminated, they reduce this possibility [13].

The major concern is for cario-active patients (those who have at least one active lesion), in whom the carious process will evolve if no preventive/therapeutical methods interfering with the advance of the disease are taken [1]. Unfortunately, on the occlusal surfaces, the distinction between the rapidly and the slowly progressive non-cavitated lesions is difficult to make.

The activity pattern of the lesion is determined by its characteristics, which indicate – or not – the loss of mineral substance in the moment of the examination [14]. Implementation of measures which will interfere with the loss of mineral substance on the enamel surface aims at maintaining the incipient lesions at subclinical level. The absence or delay of taking such measures will increase the number of lesions, which will advance, at clinical level, as non-cavitated incipient lesions.

A well-established management plan will address the level of risk and the management of the lesion within the global context of patient’s risk evaluation. The management plan should include: (I) patient’s level of risk, (II) patient’s activity level and (III) severity of the lesion.

4 groups of therapeutical strategies are recommended:

1. Strategy regarding the basal or domestic treatment (specifically at home): SDT
2. Strategy regarding the primary preventive/therapeutical treatment (in the absence of lesion): SPPT
3. Strategy regarding the secondary preventive/therapeutical treatment (already present lesions): SSPT
4. Strategy regarding the minimally invasive operative/restorative treatment: SRT

These strategies, applicable either individually or in any combination, are meant at reducing the risk the patient may face and at treating the carious lesions individually. For example, any patient showing a low caries risk should benefit from SDT personalization and adaptation, as well as from SPPT, at a frequency of the re-evaluation sessions established as a function of possible risks. A patient with a high caries risk may need all 4 treatment strategies or, if such patients do not manifest a current active carious disease, stress will be laid on SDT and SPPT, the re-evaluation sessions being more rigorous than for a patient with low caries risk [15,16].

Plans of caries therapeutical management

The present paragraph describes the management strategies for the treatment of both patients and carious lesions.

1. International Caries Detection and Assessment System (ICDAS)

The manner in which the specific lesions are treated in their various stages will depend on the level of caries risk, on the activity of the lesion and type of surface affected. Other factors that may modulate mangement decisions are patients’ expectations, their preferences and their level of compliance, the regional or national professional norms, etc. [15].
Management of the “healthy” occlusal surfaces

For the occlusal surfaces, if the patient shows a low risk, the basic care level will be maintained at home, mainly with fluoride tooth-pastes while, for patients with high risk, a personalized modification of the risk factors will be implemented, namely: improvement of oral hygiene, a more consistent utilization of fluoride, stimulation of salivary secretion, utilization of fissural sealants and diet modification. At lesion level, such interventions may be grouped into the SDT class or, when the disease is absent, into the SPPT one.

In many European countries, the unanimously accepted sealing indication is in the young permanent dentition, as part of the preventive strategy for deep fissures or for a predictable caries risk [17]. Sealing is also viewed as a therapeutical measure for occlusal lesions, active in the enamel, in young permanent dentition, while the current strategy for the occlusal lesions active in dentin is represented by the minimally invasive operative/restaurative treatment. However, sealants are frequently employed for adult patients, as well [18], and a global tendency for treating even the caries localized only in the enamel by an invasive restorative therapy is manifesting [19].

Management of initial occlusal caries

Management of these lesions depends on their condition, namely whether they are inactive (arrested) or active. For the inactive caries in patients with low risk, no additional treatment is necessary, apart from SDT. If such a lesion occurred in a patient with high caries risk, a personalized modification of the risk factors – apart from SDT – will be implemented. Management of the active initial occlusal caries also depends on tooth’s eruptive status. If the tooth is only partially erupted, one or several options will be implemented, such as: the oral hygiene may be modified for assuring an efficient brushing of the occlusal surfaces in buccal-oral direction, fluoride may be applied topically or a sealant, based on a glasionomer cement (CGI), may be temporarily applied. Once the tooth has fully erupted and is no longer covered by the mucous membrane, a sealant based on composite resins (RC) may be applied on long term.

Management of moderate occlusal caries

Management of moderate occlusal caries will depend on its condition: active or inactive and also on its Rx visibility. Inactive lesions, not visible on Rx, will be treated according to the level of patient’s caries risk: if the risk is low and the patient is older than 35 years, no additional treatment is necessary; instead, if the risk is high and the patient is under 35 years, the lesion may be sealed, on considering the future risk of new caries development. The inactive lesions with Rx transparency in dentin should be also treated on considering the cariogenous risk: if the risk is low, the fissure may be sealed, if the risk is high, a minimally invasive surgical/restorative solution will be preferred. The active lesions not visible on Rx will be either sealed or restored in a minimally invasive manner, as a function of the cariogenous risk.

Management of severe (profound) caries

Management of the deep lesions over all surfaces will involve a minimal surgical intervention, a direct preparation of the cavity exposed to caries, on paying attention to the preservation of the healthy dental structure and to a correct selection of the restoration material. The signs and symptoms of pulp involvement will decide upon the most correct therapeutical decision. The therapeutical solutions at hand are: one-step excavation and a well-sealed restoration; stepwise excavation (assuming at least 2 separate excavation sessions); the Hall crown (for decidual teeth); indirect caping; direct caping; endodontic treatment; extraction. All these therapeutical options will be combined with personalized modifications of the risk factors, as discussed above. The interventions done in this stage may be included, at lesion level, in SDT, in SPPT in the absence of the disease, in SSPT - which supports secondary prevention, or in SRT.

2. Caries management by risk assessment (CAMBRA)

An American research team (formed of Douglas A. Young, John D.B. Featherstone, Margherita Fontana, Mark Wolff, Brian B. Novy, Michelle Hurlbutt and Deborah Horlak) adopted the SIDEC, visual, tactile and radiographic methods of carious lesions classification and
implemented them in caries management as a function of caries risk (CAMBRA) [20,21].

This concept is based on the idea that carious lesions may be treated by a minimal removal of the dental structure, which assures a perfect marginal sealing of the restoration.

- Management of "healthy" occlusal surfaces

On the occlusal surfaces, the management will depend on the risk level, generally non-surgical strategies being applied. In the primary prevention of the SFO retentive complex, sealing may be optional.

- Management of initial occlusal caries

Management of initial occlusal caries from the occlusal surface will depend on the risk level, non-surgical interventions being generally preferred. In patients with low caries risk, sealing is not indicated for inactive lesions, nevertheless, it may be viewed as an option for the primary prevention of the SFO (fissural occlusal system) retentive complex. The non-surgical preventive measures will be maintained, sealing being considered as optional for the primary prevention of the SFO retentive complex. For all the other groups of risk: moderate, high and extreme, sealing is recommended.

- Management of moderate occlusal caries

Generally, the management of this caries stage will consider – for all risk levels - a minimal removal of the dental structure, which assures an adequate sealing of the restoration.

- Management of deep occlusal caries

These lesions are treated in view of their conservation, for the removal of the irreversibly damaged tissues, the objective being a perfectly sealed restoration. The infected active dentin from all active cavitated lesions should be eliminated for not endangering the asymptomatic healthy pulp. In the case of a healthy pulp-dentin organ, a conservative removal of caries is recommended, even if an infected dentin area remains. Its sealing through a correct restoration, which separates it from the nutrient sources, is more indicated than exposure of the pulp-dentin organ and treatment by direct caping.

Besides the CAMBRA management, the following caries risk evaluation (CRE)-based algorithm is recommended [20]:

Patients with low caries risk should be advised to live a healthy life, which includes a good oral hygiene, a balanced diet and the utilization of fluorinated toothpastes twice a day. For oral rinsing, a fluoride solution containing 0.05% NaF is recommended and, if the patients consume sugars, also useful are the chewing gums, or sugars may be replaced by xylitol.

Patients with moderate caries risk receive the same treatment as those with low caries risk, and also the recommendation to utilize the following additional substances: (i) a 0.05% NaF oral rinsing solution twice a day (in the morning and in the evening), (ii) professional fluoride applications each 4-5 months (NaF applied as a pellicle over all dental surfaces) and (iii) 6-10 gr. xylitol, at least 3 exposures per day (2 gr.) each time (chewing of 2 chewing gums for 5 minutes, at least 3 times a day).

The patients with high caries risk receive the same treatment as those with moderate caries risk, with the following additional measures: (i) fluoride toothpastes of high concentration (5,000 ppm) instead of the usual ones; the 0.05% NaF mouthwashes is not necessary, (ii) if a high level of cariogenic bacteria – identified through ATP bioluminescence or through cultivation - an antibacterial treatment is recommended. If the fluoride and the antibacterial treatment are not efficient, possible alternative options are: iii) calcium phosphate-based products and (iv) strategies for the neutralization of acidity in the oral cavity.

The patients with extreme caries risk (showing xerostomia/hyposalivation and a high risk level) need the same treatment as those with high caries risk and, additionally, professional fluoride applications each 3 months. Other options, such as addition of calcium and phosphate or the strategies of pH neutralization, should be also had in view.

The above-presented scheme may be modified for the treatment of a strongly cariogenous biofilm and/or of high pH variations. Some practitioners prefer to classify patients as: without and with risk. Really important is not the risk level, but the availability of several
therapeutical options helping the patient maintain a healthy condition and prevent possible carious diseases.

3. The Caries Management System (CMS) (Wendell Evans, University of Sydney, Australia). Basically, CMS makes use of CRE by combining dental care at home with professional therapies, at both patient and tooth level [22,23].

The interventions at patient level address the risk factors liable to modification, which encourage the disease. At home: fluoride toothpastes twice a day, antimicrobial and fluoride-containing mouthwashes, healthy food. In the dental office: clinical examination, motivational interview for improving the basic level of home care: recommendations on the oro-dental hygiene, oral health education, limitation of sugar consumption and less snack moments.

The interventions at dental level address risky areas and specific lesions, professional treatments of the surface being applied in such cases: fissural sealants, application of fluoride-containing varnishes and restorative treatments.

The obtained results are monitored: at patient level, through (i) behavioral modification, (ii) maintaining of low scores of the microbial biofilm and (iii) reduction of carious lesions incidence; at dental level: (i) stopping the evolution of carious lesions, (ii) lesions’ remineralization and (iii) evaluation of sealings’ and restorations’ status.

CMS protocols
Risk evaluation, caries management, monitoring and the scheme of the re-evaluation sessions for both adults and children are established in separate protocols. The interventions are specific to each level of risk, and criteria recommending a surgical or non-surgical method are settled, meaning that the patients with low caries risk are first controlled as to their home care level.

Patients with moderate caries risk are approached through treatments with fluoride varnishes and initial monitoring at each treatment session, then each 6 months. Patients with high caries risk receive a similar treatment, with the exception of the fluoride-containing varnishes, which are applied each 3 months. The objective is that of having the ones with high caries risk considered in the group of those with moderate and then low caries risk.

All patients are advised as to their oral hygiene and are encouraged to use fluoride toothpastes 2 times a day. The aim of this home care measures is of preserving the healthy dental surfaces healthy indeed (for reducing caries incidence), of blocking the evolution of active lesions and of maintaining the condition of caries with interrupted evolution.

- Management of incipient caries: the objective is of blocking the evolution of white-spots, thus preventing their cavitation. These lesions are treated with a fluorinated pellicle. The occlusal lesions with microcavity in the enamel are sealed with RC-based seals.

- Management of moderate caries: the non-cavitory dentinary lesions are treated intensely, according to a scheme of fluoride use, as a function of caries risk, and also with antimicrobial substances. The cavities occurring in the enamel are treated with sealants.

- Management of deep caries: the cavities in dentin, in decidual teeth are not restored in the last year prior to exfoliation; in all the other cases, the treatment is operative/restorative.

4. Protocols recommended by the system of caries classification according to ADA (The American Dental Association)

In 2008, ADA proposed another classification system, now under clinical validation (as to its sensitivity, specificity, reproducibility), included in the FDI World Dental Federation Caries Matrix [24].

When the classification done according to lesion’s extension is combined with other elements of a system of caries management, namely localization (teeth, site and number of affected surfaces), caries activity and patient’s individualized caries risk, as well as the stages of caries management will provide information supporting the decision for a non-surgical (preventive/therapeutical and remineralization) or surgical (operative/restaurative) treatment, to be applied to any incipient, moderate or deep carious lesion.
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- Management of healthy surfaces: not stated in the present system
- Management of incipient caries: as a function of caries extension, localization, activity and of patient’s individualized caries risk, a treatment adapted to patient’s risk level may be decided – namely a surgical or non-surgical intervention. In most of the cases, the treatment applied to incipient lesions will be a non-surgical one.
- Management of moderate caries: usually, a surgical one
- Management of deep caries: in almost all cases, a surgical treatment

If considering the modern trends [25], in cases of non-cavitory lesions, a careful clinical evaluation, including evaluation of the lesional pattern of activity, as well, remains the main instrument on whose basis the immediate treatment requirements and the possibilities of evaluating the results of the non-surgical preventive/therapeutical interventions may be established. Even if the moderate occlusal lesions occurring in permanent dentition may be treated through microinvasive fissural sealing, by extending the sealing indications to the low and moderate lesion level, as well, traditional restoration of the occlusal surfaces will be delayed and even avoided, with beneficial effects upon the oral health condition of our patients.

Re-evaluation, control and monitoring sessions

Any clinical-therapeutical system for the management of carious lesions includes the final – yet not less important stage – establishment of the re-evaluation and monitorization sessions, which will assure a more dynamic, continuous control of the carious disease. It also intensifies the preventive character of the therapeutical strategy while assuming, at dentition level, control of the clinical status (as well as Rx, if possible) of dentition, for evidencing new lesions or for observing whether the previously identified ones had advanced, arrested or regressed. The advantage of determining the efficiency of previous treatments permits the elaboration of new strategies, capable of leading to improved results. When the recommendations on the behavioral modifications have been observed and the clinical objectives attained, this will be communicated to the patient, thus encouraging him/her to continue dental care at home as efficiently as possible. The intervals between these sessions (of 3, 6, 12, 24 months) should be established as a function of the level of dental affection and of the individual caries risk [26].

References