



## Basic terminology in epidemiology of the dental caries and periodontal disease – part two

The first part was spoken at the 3rd of March 2020

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### The Papilla Bleeding Index (PBI)

The PBI discriminates four different degrees (intensities) of bleeding subsequent to careful probing of the gingival sulcus in the papillary region. Probing isn't performed in all four quadrants. To simplify the recording of the PBI, quadrant 1 is probed only from the oral aspect, quadrant 2 from facial, quadrant 3 again from oral, and quadrant 4 from the facial. Bleeding scores are entered into the chart. For use in the dental practice, several such forms may be arranged side by side. In this way findings recorded over a period of time can be conveniently compared. Any reduction in bleeding is an indication of a return to health of the gingiva. This will also be clear to the patient.

The PBI was developed for use in the private practice and not for epidemiologic studies. It is a sensitive indicator of the severity of gingival inflammation in individual patients. The PBI has proven to be particularly useful for gauging success or failure during a course of periodontal therapy. While the patient watches in a mirror, the practitioner can score the intensity of papillary inflammation. In this way, the PBI can also serve as an excellent method for motivating the patient toward good oral hygiene. The patient can see when the gingival tissue bleeds, which helps him to realize where the diseased sites in his mouth are located. Throughout therapy, repetitions of the PBI indicate to the patient any decrease in inflammation.

Bleeding is provoked by sweeping the sulcus using a blunt periodontal probe under light finger pressure from the base of the papilla to its tip along the tooth's distal and mesial aspects. After 20-30 seconds, when a quadrant has been completely probed, the intensity of bleeding is scored in four grades and recorded on the chart. The sum of recorded scores gives the „bleeding number“, the PBI is calculated by dividing the bleeding number by the total number of papilla examined.

#### Scoring of the PBI:

Grade 1 – point: 20-30 seconds after probing the mesial and distal sulci with a periodontal probe, a single bleeding point is observed

Grade 2 – line / points: a fine line of blood or several bleeding points become visible at the gingival margin

Grade 3 – triangle: the interdental triangle becomes more or less filled with blood

Grade 4 - drops: profuse bleeding. Immediately after probing, blood flows into the interdental area to cover portions of the tooth or gingiva

## Periodontal indices

The determination of the severity of periodontitis through use of an index is really impossible. In contrast to a gingivitis index, which must only record the intensity of inflammation, any periodontitis index must be, above all, measure the degree of loss of tooth-supporting tissues (attachment loss). Periodontal indices find their most important use in epidemiologic studies. In private practice, a periodontal index may provide a quick overview of a patient's condition, but no index can ever replace a thorough individual examination. The CPITN is an index that combines measurement of the severity of disease as well as the necessity for treatment.

### **Community Periodontal Index of Treatment Needs (CPITN)**

The CPITN was developed in 1978 by the WHO for epidemiologic studies. It is today the most often employed index. The major difference between the CPITN and other indices is that it determines not only the severity of gingivitis and periodontitis, but also provides data concerning the extent of therapy that is necessary. The examination is performed with a special probe, which serves more to determine what is normal (healthy) and what is abnormal (diseased) than to provide measurement of probing depths in millimetres. The CPITN is taken by sextants. A disadvantage of the CPITN is that attachment loss due to recession is not discerned. In general only the highest score in any given sextant of teeth examined in adults is recorded. In the case of young patients (up to 19 years of age) and in epidemiologic studies the examination of one anterior tooth in the maxilla and the mandible, and the first permanent molars (or the second molars) is required.

### **CPI-codes and Treatment Needs (TN):**

**CPI:** the index scores (codes) describe the severity of disease, some aspects of the etiology (calculus), as well as symptoms such as bleeding upon probing. The absolute probing depth in mm is determined only secondarily; any gingival recession that might be present is not recorded at all

**TN:** the index code prejudices the necessary treatment inasmuch as the absolute index score (4) does not correlate with the code from the „treatment package“ (3). Codes 2 and 3 demand identical therapy!

The CPITN probe has a small sphere on its end, 0,5mm in diameter, and a black marking between 3,5 and 5,5mm. Probes with markings at 8,5 and 11,5 mm are also available for use in practice. The black marking is still partially visible during a probing at code 3, but disappears completely into the periodontal pocket at the code of 4.

CPITN in young adults to age 19: measurements are made around each of the CPITN teeth,, one in each sextant. The index codes are noted (teeth 17,27,37,47 are alternative teeth in case the first permanent molars are missing)

CPITN for adults: all teeth are examined. Only the highest measured index code per sextant is recorded. The definition of the sextant is seen in the schematic picture.

## The Gingival Sulcus

We must differentiate between the **clinical** and the **histological** gingival sulcus. The histological gingival sulcus has a depth of about 0,5mm. Clinically, using 20-40Ponds of force on a graduated instrument, the sulcus may be probed to a depth of between 1 and 3mm

without causing the patient any pain. The histological sulcus can also be „blown open“ with an air stream.

A pathologically deepened clinical sulcus is called a gingival pocket. It is an early sign of marginal periodontitis.

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#### Measurement of Gingival Sulcus Depth

Insert the graduated periodontal probe into the gingival sulcus as nearly as possible parallel to the long axis of the tooth root until you meet resistance and the patient feels mild discomfort. Don't be too gentle! Exert 20-30 Ponds of force. Check the amount of force applied using a force gauge. Interproximally, it is not possible to insert the probe exactly parallel to the long axis of the tooth; rather, the probe must be positioned on a slight diagonal toward the col area. You will frequently encounter bleeding from the gingival sulcus, but this should not influence your measurements.

#### How to use the DMFS Index

We determine the DMFS index under the following conditions:

1. Third molars are not included.
2. Maximum number of at risk surfaces = 128
3. The determination is made first on all surfaces clinically, using mirror and explorer, independent of radiographs. Subsequently, only the proximal surfaces are examined for caries radiographically, without reference to the previously obtained data sheet. This is done by combining and cross-checking clinical and radiographic findings. Finally, The DMFS can be calculated.
4. „D“ (decayed). Initial lesions (chalky spots – be sure to dry the teeth thoroughly!) as well as frank carious defects are counted. Be sure to examine carefully the cervical portion of the tooth crown for white spots.

#### Definition of grade of lesion severity

Fissures, pits

Grade 0 : healthy

Grade 1 : thin, light line. Chalky margin of fissure or pit

Grade 2: thin, brown- to- black line

Grade 3: frank defect, less than 2mm in extent

Grade 4: frank defect, greater than 2mm

Smooth surfaces, proximal surfaces:

Grade 0: healthy

Grade 1: chalky spot less than 2 mm in extent

Grade 2: chalky spot greater than 2mm

Grade 3: frank defect less than 2mm

Grade 4: frank defect greater than 2mm

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A DMFS Index in which initial lesions are also included is referred to as D1-4MFS Index. In the D3,4MFS Index, only actual carious defects or cavities are counted.

If both a smooth surface lesion of severity Grade 2 and pit lesion of severity Grade 3 are detected on the same surface, only the more severe of the two is counted

If no caries can be detected by clinical examination of the tooth surface, this surface is scored as healthy, even if the examiner is not certain that it really is healthy. Such is often the case with proximal tooth surfaces.

#### Definition of radiographic grade of lesion severity on proximal surfaces

Grade 0: healthy – no radiolucency signs

Grade 1: radiolucency in the outermost half of the enamel. Initial lesion

Grade 2: radiolucency also in the inner half of the enamel. No dentinal alteration

Grade 3: radiolucency extending completely through the enamel, with evident radiolucency in the peripheral dentin substance

Grade 4: obvious dentinal radiolucency, even close to the pulp

When radiographically detectable radiolucencies exist in fissures, pits or on smooth surfaces, one is always dealing with clinical Grade 4 carious defects, i.e., with a large cavity.

#### „F“ (filled = 5)

If a filling with secondary caries is detected on a tooth surface, that surface is counted as a „D“ and not as „F“. Alternatively, a special category, „D+F“, may be employed.

Gold crown or post crown

On molars..... all 5 surfaces are counted

On bicuspid only 3 surfaces are counted

On anterior teeth all 4 surfaces are counted

#### „M“ (missing =6)

Here the same rules as those given for crowned teeth are applicable.

## Radiographic Caries Diagnosis

### 1. Material j.kuklová

Bitewing radiographs for simultaneous depiction of posterior tooth crowns in maxillaa and mandible

Periapical radiographs: large for posterior teeth, small for anterior teeth

### 2. Terminology

The radiograph is a two-dimensional light-dark picture. It is always the negative which is observed and evaluated.

Radiopaque = structures which do not permit the passage of x-rays; the film is therefore exposed incompletely (if ever). Transparent, light areas on the radiographic negative are caused by radiopaque structures

Radiolucent = structures which permit the passage of x-rays, yet offer some resistance; the film is therefore heavily exposed. Dark, or even black areas on the radiographic negative are caused by radiolucent structures

### 3. Differentiation among radioopacities

Complete opacity is caused by metals, for example silver amalgam or gold fillings

Strong opacity is caused by enamel, due to its dense structure and high mineral content (98%)

Medium opacity is caused by less dense structures such as dentin and dental calculus. Mineral content of dentin is 75%, of calculus 50-75%, depending on its age. The opacity caused by osseous tissue (mineral content 65%) depends essentially upon bone structure. A strong opacity is occasioned by the thick cortical bone and weaker one by areas of cancellous bone. For example, the cortical bone inside the dental alveolus is a clearly visible radiopaque structure, called the lamina dura

Weak opacity is caused by the dental pulp, the periodontal ligament and by the bone marrow.

### 4. Caries diagnosis

Because of demineralization, radiolucencies become apparent in the normally radiopaque enamel and dentin

Radiographic classification of proximal lesions:

Grade 1: wedge-shaped radiolucency in the outermost enamel layer (chalky spot)

Grade 2: radiolucency also extends into the inner enamel layer (chalky spot or initial lesion)

Grade 3: earliest evidence of cone-shaped radiolucency in the dentin beneath the enamel (this represents a certain defect)

Grade 4: radiolucency extends into deeper dentin layers (carious defect, carious cavity)

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Occlusal and smooth surface caries lesion are visible on the radiography only when they are very deep.

Root caries may be observed below the radiographically evident proximal cemento-enamel junction. These lesions are usually wide, not generally very deep, and can only be seen on the radiograph when located proximally. It is easy to mistake them for artefacts

### **Differential diagnosis for carious lesions**

Enamel opacities, enamel fluorosis: not visible radiographically

Enamel hypoplasia: only visible if very large; light area

Enamel erosion: seldom detectable on the radiograph

Wedge-shaped cervical defects (for example toothbrush abrasion): if severe, seen as a radiolucency

With bitewing radiographs, 20-100% more carious lesions of proximal surfaces of posterior teeth can be detected than with the use of mirror and explorer alone. But the x-ray doesn't see everything either! 70% of initial carious lesions cannot be detected on the bitewing radiograph, even though clinically (on the extracted tooth) a chalky spot or even a microdefect is already present. The radiographic picture lags behind the actual microscopic situation. The radiographic latent period for lytic alterations (resorption) of bone is about 3 weeks; for demineralization of enamel (chalky spot formation), it averages about 6 months.

### **Practical recording of the DMFS Index**

#### **1. Clinical DMFS**

It is important to proceed systematically. Use the air syringe to remove oral fluid from the teeth. Begin in right maxillary quadrant, examining first the second molar tooth, then the first molar, and on around the arch to the central incisor. Then examine the right mandibular quadrant, again beginning with the second molar, then the first molar, and on to the incisors. Next examine the left side of the mouth, first the maxillary and then the mandibular teeth.

On each tooth, ***the following order*** of surfaces should be observed during examination:

#### ***Oral – occlusal - facial – distal – mesial***

Examine the teeth primarily by using your sense of sight. The explorer should be used whenever you experience doubt about a tooth surface. Dictate your findings to a classmate. He knows on which surface of which tooth you have begun the examination, and he will enter your dictated value into a prepared data collection sheet.

It is better to dictate numbers rather than letters of the alphabet.

0.....zero means healthy

1,2,3,4:... these numbers signify decay („D“) and express the severity of the carious lesion ( 3=D3)

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5.....means „F“ ( think of filled, five, filling)

6... ..means „M“ ( missing, extracted: „ex“ = „six“)

7.....means unerupted

When the examination procedure described above is employed, it is really not necessary to enter the findings into a prepared data collection sheet. Continuous rows and columns of numbers are just as comprehensible, for example 3 5 1 0  
5

5 5 5 5

5

Since the clinical findings will subsequently be compared with the radiographic findings, the use of a prepared data collection sheet is somewhat less abstract for the beginner. The findings shown above would look like this when entered: tooth  
17

Buccal	1
Distal, occlusal, mesial	0 5 5
Palatal	3

## 2. Radiographic DMFS findings

The radiographic „eye“ can see proximal caries better than the clinical eye, but is not very reliable with regard to occlusal and orofacial carious lesions. For this reason, the radiographic findings serve to clarify clinical findings only in the proximal areas (in the prepared data collection sheet, spaces for the orofacial and occlusal surfaces are not used)

Sometimes the proximal surfaces cannot be adequately examined because of overlapping caused either by the angle of x-ray projection or by the malalignment of teeth. In these instances, an „X“ is entered. Thus, as far as such „X“ proximal surfaces are concerned , the final DMFS Index is derived only from clinical examination.

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