

## Complete excavation or removal of carious tissues to hard dentin: Overtreatment.

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For many years most Schools of Dentistry have taught that all carious tissue must be removed, and this was considered the gold standard in cavity preparation. Therefore, many dentists continue this practice despite being considered incorrect by the progressive development of minimally invasive dentistry that advocates a much less invasive approach.<sup>1</sup> The complete excavation or removal of carious dentin is currently considered over-treatment.<sup>2</sup>

At this time, the treatment of carious lesion should be based on the principles and techniques of minimally invasive dentistry.<sup>3</sup> Thus, the correct diagnosis of the extent of carious lesion and the degree of pulp involvement is critical to determine whether an invasive endodontic treatment or a conservative operative procedure is indicated. Nevertheless the terminology used in this matter is not homogenous, which is problematic. As such, in order to avoid misunderstandings there is a need to unify the terminology used for carious lesions and tissue removal procedures, establishing well-defined criteria for the treatment of caries.

The International Caries Consensus Collaboration Group (ICCC), in its convention in Leuven (Belgium) in 2015, has proposed important changes with regard to the terminology, management of caries, and operative techniques indicated for the treatment of the different types of dentin carious lesions. The results of this consensus has been published recently,<sup>1,2</sup> representing an important frame of reference for the treatment of carious lesions.

To relate the clinical signs of caries with the histopathological state of the dentin carious lesion is not easy. The visual and tactile assessment of dentin (color, degree of hardness and moisture) can inform about what is happening histopathologically. The demineralization of the dentin brought about by dental caries induces a decrease in the hardness of dentin, which is in more easily deformed, penetrated, and removed by exploratory instruments. Therefore, obtaining tactile information about the hardness of the dentin in the carious lesion, using the dental probe, is the best way to determine the degree of carious involvement.<sup>2</sup>

According to ICCG group, four different states of the dentin hardness can be established. Soft dentin: deforming when pressed by a hard instrument and requiring little force to be easily scooped with a sharp hand excavator. Histopathologically, it is necrotic dentin contaminated with biofilm. Leathery dentin: when explored with the dental probe it resembles touching leather. It does not deform under pressure, but can be easily excavated without much force. From the histopathological point of view, it is demineralized dentin. Firm dentin: does not deform under pressure and is resistant to hand excavation. It corresponds to sclerotic dentin. Hard dentin: resistant to hand excavation when the tip of the dental probe is scrapped

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across the hard dentin a scratchy sound is made, named “cri dentinaire”; it is normal healthy dentin. The ICCC group recommends avoiding the term “infected dentin” because its use may lead to the incorrect belief that caries is a transmissible disease.<sup>2</sup>

In relation to operative techniques for carious tissue removal, the main aim is to retain the tooth and the health (sensibility/vitality) of its pulp for as long as possible.<sup>4</sup> The ICCC group differentiates four basic strategies, according to the degree of carious tissue removal performed with rotary instruments.<sup>2</sup>

1) No removal of carious tissue, controlling carious lesion without removing the affected dental tissues. It is indicated in small or moderate noncavitated lesions, reaching at most the external third of the dentin. Include the Hall technique, fissure sealants and nonrestorative cavity control.<sup>2</sup>

2) Selective removal of carious tissue, in order to avoid the risk of pulp exposure in decayed teeth that show no symptoms or signs of pulp inflammation.<sup>4,5</sup> To ensure peripheral sealing, carious tissue should be removed around the cavity until there is only healthy enamel, hard dentin or both. On the contrary, in superficial or medium lesions (caries that do not reach the inner third/quarter of the dentin wall) carious tissue should be removed in the pulp surface of the cavity until firm dentin is reached, whereas in deep carious lesions (caries extending radiographically more than two-thirds/three-quarters through dentin) the elimination should be made down to soft dentin.<sup>2</sup>

3) Stepwise removal of carious tissue, with the carious tissue removal carried out in two steps, aiming to avoid the highest risk of pulp exposure.<sup>6</sup> It is indicated in permanent teeth that present deep carious lesions whose treatment can

compromise the dental pulp.<sup>4</sup> In the first step, the removal should be made to soft dentin, leaving soft caries in the pulp surface of the cavity, and hard dentin at the periphery to achieve a correct seal. Then, a restoration with temporary material is performed and kept in place for 6-12 months. In the course of this time, remineralization of demineralized dentin, formation of tertiary dentin and inactivation of the remaining bacteria will occur.<sup>7</sup> In a second step, the provisional filling is removed, the degree of hardness and color of the dentin assessed, and the dental tissue is eliminated to leathery dentin on the pulpal wall. Then, the final filling is performed. Recent evidence indicates that the second stage may be omitted as it increases the risk of pulp exposure and pulpal damage besides adding greater cost, time and anxiety to the patient.<sup>2,8</sup>

4) Nonselective removal to hard dentin, reaching hard dentin in all cavity walls, involving a high risk of pulp exposure and, in addition, leaving thin and weakened walls and involving the unnecessary removal of dental tissue.<sup>8</sup> This operative procedure is also known as complete removal of carious tissues, and, nowadays, it is considered over-treatment.<sup>1,2</sup>

In conclusion, a thorough radiographic study of the carious lesion before the operative procedure, to determine its depth extension and the pulp involvement, allows for the correct choice of procedure in each case. During the operative procedure, a systematic tactile examination of the carious tissue with the dental probe permits identifying the type of dentin and consequently decide upon the degree of carious tissue removal. Complete and non-selective removal of carious tissue to hard dentin in all cavity walls is over-treatment, and is not indicated in any case.

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