

# Dentin preservation

## *How to remove caries using the SmartPrep System*

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Following are step-by-step procedures for caries removal using the SmartPrep system. To use the SmartPrep polymer rotary instrument properly, a rotation of 500 to 800 rpm is required. Use a light brushstroke during operation, essentially teasing out the carious tissue—a significant departure from previous techniques that use traditional carbide burs for caries removal (Fig. 1).

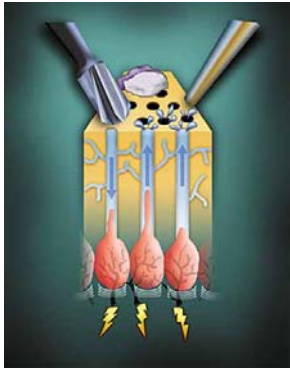


Fig. 1 Dentin after decay removal using a carbide bur reveals many exposed dentin tubules that provide a direct link to nerve endings in the pulp chamber, requiring local anesthesia to insure patient comfort. Carbide burs cannot discriminate between healthy and infected dentin.

1. Remove sharp and ragged enamel edges before introducing the instrument. Use the access burs included with SmartPrep Access Kit to gain access through enamel to avoid dulling the polymer instrument.
2. Following entry into the center of a suspect lesion or into a lesion that is already visible, introduce the SmartPrep instrument into the center of the lesion. Note: This helps to avoid unnecessary initial contact with healthy dentin that could dull the instrument.
3. In all caries preparation classes, start in the center of the lesion removing the most superficial, softest decay. Then, work laterally, to remove layer by layer throughout the lesion and, finally, clean the entire cavity

floor. Note: Avoid going from removal of shallow decay to cleaning the cavity floor in one area only and then repeating the same procedure in an adjacent area. This approach will prematurely dull the instrument and make caries removal in adjacent areas more difficult. Premature contact of the instruments with hard enamel, healthy dentin, or restorative materials results in dulling and premature failure of the instrument

4. Use the instrument to clean the cavity floor with more forceful strokes. Note: This conserves healthy tissue due to the self-limiting action of the instrument, which greatly decreases the possibility of inadvertent pulp exposure situations.

5. Carefully examine the area to confirm decay removal.

### **Case presentation**

A patient presents complaining of a cavity in her lower left tooth (Fig. 2). She reports no discomfort and desires to have the cavity treated. The lower left second premolar (tooth #20) has a Class V carious lesion. It was decided to remove caries using the SmartPrep instrument. No anesthesia was delivered despite the depth of the lesion.



Fig. 2 Caries as it presented in the facial aspect of a lower left second premolar.

1. Because the lesion is easy to access and there is no ragged or sharp enamel to remove, the lesion was immediately removed using a #4 SmartPrep instrument (Figs. 3 and 4) and a Rotary Master variable speed electric latch-type handpiece (J. Morita USA) at 800 rpm. Note: During caries removal, the patient reports no discomfort despite the close proximity to the pulp.



Fig. 3 A #4 SmartPrep instrument positioned prior to use.



Fig. 4 The instrument removes only carious dentin; no anesthesia is used.

2. Because this instrument is capable of removing only caries, check any remaining discolored dentin for the presence of caries. Note: Following complete caries removal (Fig. 5), despite the appearance of yellow, discolored dentinal at the gingival aspect of the preparation, the tissue does not require removal. This tissue is non-carious, secondary dentin that cannot be removed using the instrument, a safety feature that avoids needless removal of healthy dentin.



Fig. 5 Following caries removal, a near pulpal exposure was easily prevented with the SmartPrep instrument, which is incapable of removing secondary dentin.

3. Restore the tooth using Palfique Estelite microfill composite resin (J. Morita USA) [Fig. 6].



Fig. 6 The completed restoration.

This technique also applies to these cases:

**Class I:** To gain access to the carious lesion, center the appropriate access bur in the groove in the most involved area, and then expand from there. The Fissurotomy bur (SS White), or the #329 carbide bur (SS White) in a large lesion, may be appropriate for gaining this initial access. The SmartPrep instrument is then used to complete the removal of all decayed dentin.

**Class II:** To create access, remove the appropriate marginal ridge until accessing caries. The #169L (SS White) or the #329 bur may be appropriate for gaining access. Then enter obliquely with the instrument. When operating in a narrow V- shaped lesion, the instrument's edges may become worn, yet the tip remains intact, indicating it has not yet reached the full lesion depth, but has removed decay only along the cavity walls. In these cases, switch to a smaller round size, such as a SmartPrep #2 instrument, and complete caries removal along the cavity floor.

**Class III and IV:** Cut through the marginal ridge obliquely into the anticipated center of the lesion. Using a #329 bur is suggested. Then use the SmartPrep instrument to complete removal of all decayed dentin.

**Class V:** Expand the enamel opening laterally, and if required, remove all ragged and sharp edges of the enamel from around the lesion using an appropriate bur (i.e., #169L). The carious dentin can then be removed using the instrument.

## Technique SmartPrep System

### Features

- Blade configuration and material structure leaves healthy dentin unprepared and intact
- Polymer technology
- Conserves healthy tooth structure
- Incapable of cutting healthy dentinal tissue
- Eliminates contact with dentinal tubules by not preparing healthy dentin
- Exceptional tactile sense when encountering decay using instrument
- Designed to reduce pain
- In many cases, anesthesia is unnecessary
- System includes an access kit to allow access to infected dentin, through enamel, prior to introducing the instrument
- Single-patient-use instrument
- Sizes: RA#2, RA#4, and RA#6



**SS White Burs Inc.**

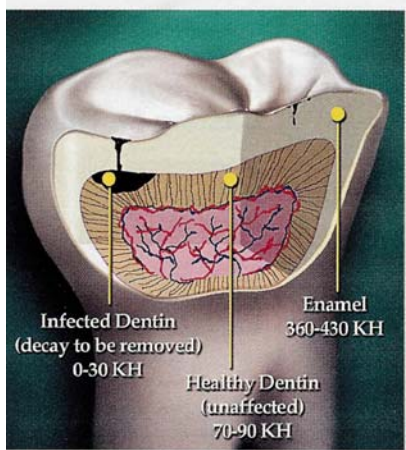
[www.sswiteburs.com](http://www.sswiteburs.com)

1145 Towbin Ave.  
Lakewood, NJ 08701  
**800-535-2877**

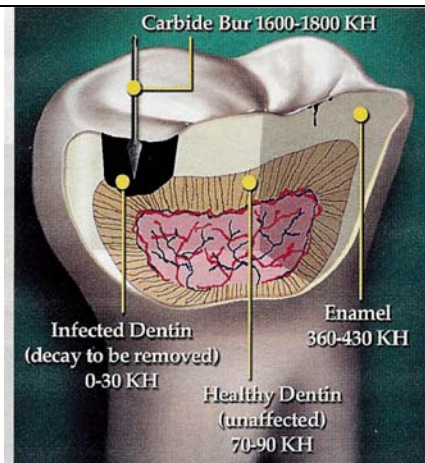
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## The basics of the Knoop Hardness Test

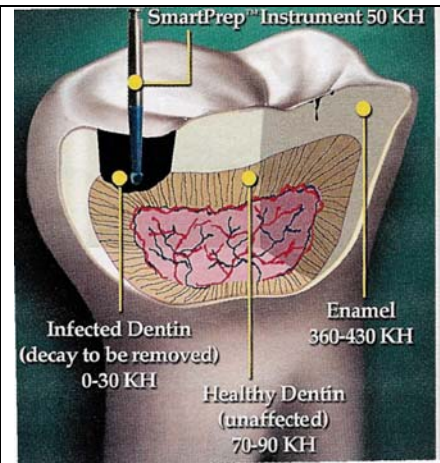
By Dr. Ian Shuman



**Fig. 7** Knoop Hardness (KH) variations of infected dentin, healthy dentin, and enamel differ greatly.



**Fig. 8** After gaining access, switch to the SmartPrep slowspeed instrument. *Note:* KH Value of the carbide instrument compared to the healthy and infected tooth structures: It is able to indiscriminately cut all surfaces.



**Fig. 9** Bond, fill, and cure the restoration. *Note:* KH Value of the SS White polymer instrument compared to healthy and infected tooth structure: It is unable to cut enamel and healthy dentin.

When treating a carious lesion, it is important to remove only the infected tooth structure and not to invade and needlessly remove healthy tissue. There have been tremendous advances in the recognition of what is considered active, carious tooth structure and the methods for identifying that material. In the past, however, there was no method for the sole removal of that diseased tissue while leaving healthy tissue undisturbed.

With the advent of the SmartPrep System, however, there now is a method for safely removing only carious dentin, leaving healthy dentin undisturbed and protecting against unnecessary pulpal exposures. What makes this instrument so unique is that it is designed to contact very few, if any dentinal tubules. The benefit is that in many cases, treatment can be initiated and completed without the use of anesthesia. This is considered revolutionary in the field of restorative dentistry.

To learn how this instrument works, it is important to understand the basics of the Knoop Hardness (KH) Test and how it relates to instrumentation and tooth structure. The **KH** Test is a micro-indentation method suitable for measuring the hardness of many materials, including brittle substances such as tooth dentin and enamel. Here's how it works:

.The lower the **KH** Value, the softer the material (e.g., carious dentin and the polymer resin of the Smartprep instrument).

.The higher the **KH** Value, the harder the material (e.g., healthy dentin, enamel, restorative materials and carbide burs).

As long as the **KH** Value of an instrument is higher than the material for which it is intended to cut, it will cut without much effort. An instrument with a

**KH** Value lower than the material that it encounters will not be able to penetrate that material.

Therefore, if the **KH** Value of an instrument is

higher than carious dentin, it can remove carious dentin. However, if the KH Value of the instrument is lower than healthy dentin, it is incapable of cutting healthy dentin and, therefore, will conserve this healthy tooth structure.

The SmartPrep instrument is especially designed to remove only decayed material after access has been created using another instrument (Figs. 7, 8, and 9). It is not designed to cut or remove enamel, composite, amalgam, cementum, or healthy dentin. The instrument dulls quickly when it comes in contact with these harder substances. As a result, it is designed to protect against unnecessary pulp exposure. When the instrument is in use, very few, if any, dentinal tubules are contacted or disturbed. This design feature allows for cavity preparations to be completed without the use of anesthesia in many instances, which makes multiple quadrant work during a single patient appointment possible.