

CEREC 3D Preparation Guidelines

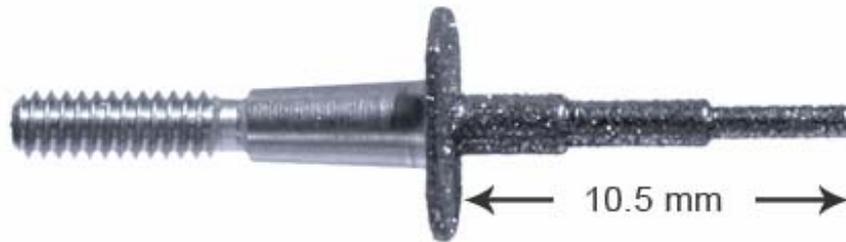
Before knowing exactly what the preparation guidelines are for **CEREC**, we must first understand how the milling instruments work and what we can do with them.

Let us start with the orientation of the milling instruments. The Step Bur 10 is positioned on the left side of the milling unit and is responsible for milling the intaglio (fitting surface) of the restoration. For this reason the Step Bur 10 has the greatest bearing on our preparation guidelines. The Cylinder Pointed bur, positioned on the right side of the milling unit, mills only the occlusal surface and therefore has little impact on these preparation guidelines.

Let's now look at the dimensions of the available milling instruments. The Step bur 10 has an effective milling length of 10.5mm.

Step bur 10

Mills the fitting surface of the restoration

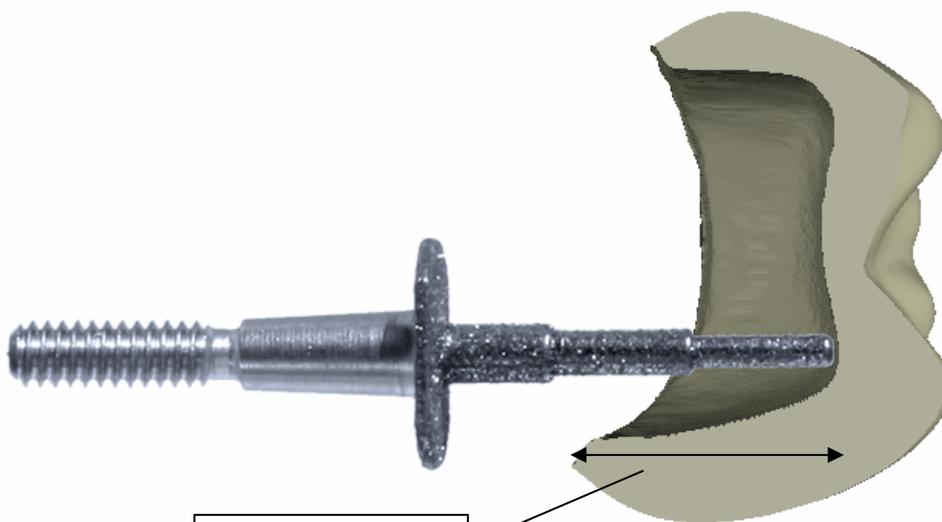


Cylinder Pointed Bur

Mills the occlusal surfaces only



As you can see below, our first preparation requirement is: the lowest point of the preparation should not be greater than 10.5 mm from the highest point.



This distance should not exceed 10.5 mm



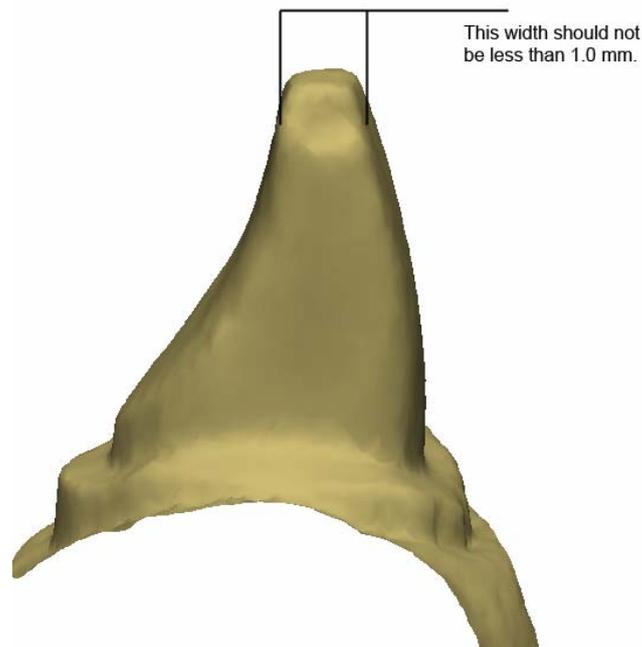
Here's another way of looking at the same case:



So much for the length, what about the diameter of the burs?

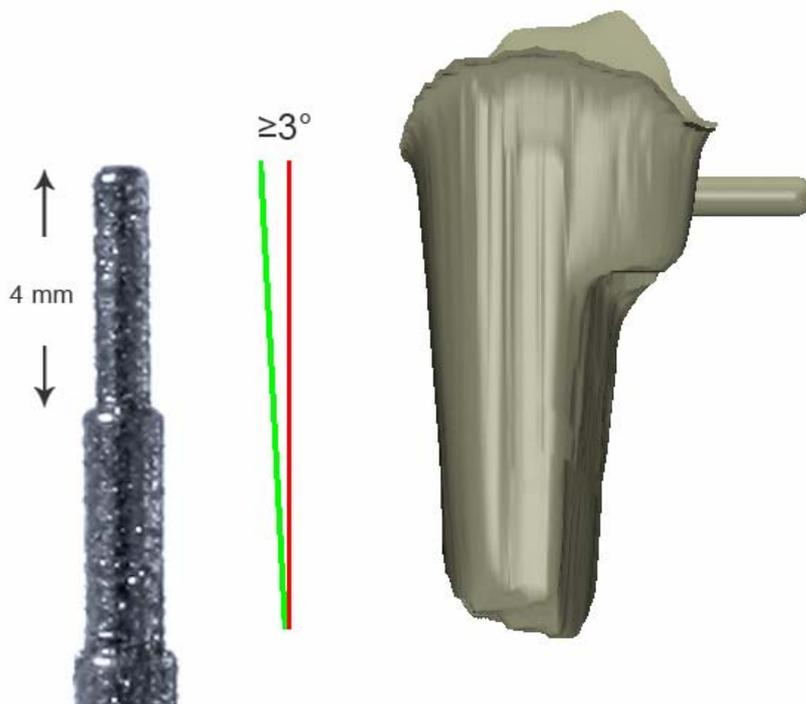
With molar preparations the diameter of the bur does not have too great an effect. As we approach the anterior, however, the diameter becomes more important due to the fact anterior teeth are generally smaller than the posteriors, especially in the mandible.

Preparation of anterior teeth must account for the 1.0 mm tip of the Step Bur 10 carving the inside of the crown. For example, the width of the preparation at the occlusal should not be less than 1.0 mm. See below:



Tall vertical walls

Unusually tall vertical walls (greater than 4 mm in length) need caution due to the configuration of the Step Bur which is used to mill the intaglio of all restorations. The Step Bur is able to mill a 0° surface which is less than 4mm in length. Surfaces greater than 4mm in length should have a 3° taper or greater. This is due to the “steps” of the bur. See below:

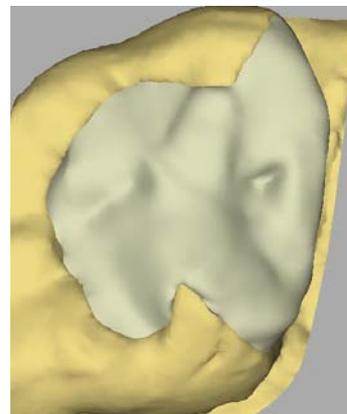
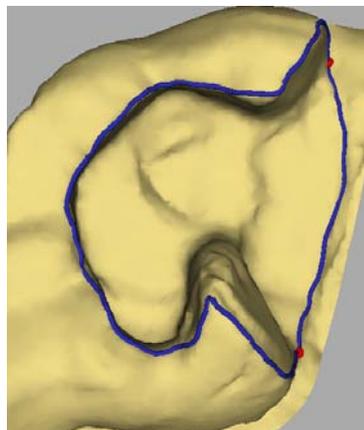


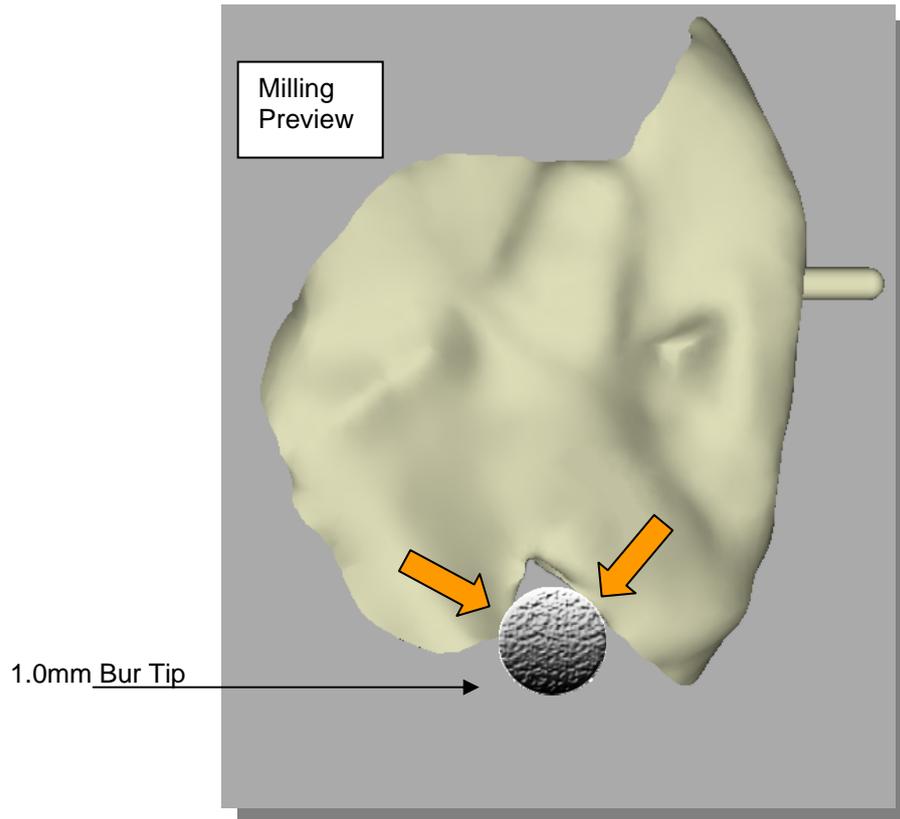
Nearly all restorations can be milled with only the top 4 mm of the Step Bur. For surfaces greater in length (e.g. endo restorations) please be sure the preparation has at least 3° of taper.

If 3° of taper cannot be achieved be sure to mill in the “Step Bur” mode (this mode can be selected in the Milling Preview stage).

Tight Corners

Another area of concern with regard to the milling instruments is corners and extensions. Keeping in mind the diameter of the two instruments (Cylinder Pointed Bur: 1.6 mm and Step Bur 10: 1.0 mm) we can recognize areas where the instruments are unable to adequately remove material. For example:





Obviously the Step Bur 10 would have great difficulty milling such a corner. The arrows indicate the areas of immediate binding. The software will also attempt to incorporate the tapered bur in such cases, but it is often not an ideal result, leaving behind excess material which the operator must manually adjust.

Recommendation:

Ensure corners of the cavosurface margin have greater than 1.0 mm diameter.



Endocrowns

From a point approximately 400 microns in from the most cervical aspect of the Preparation Margin the software preserves a “holy zone” (Fig. 1). Material milled in this zone follows the preparation as exactly as possible and will not be sacrificed by the burs in any way.

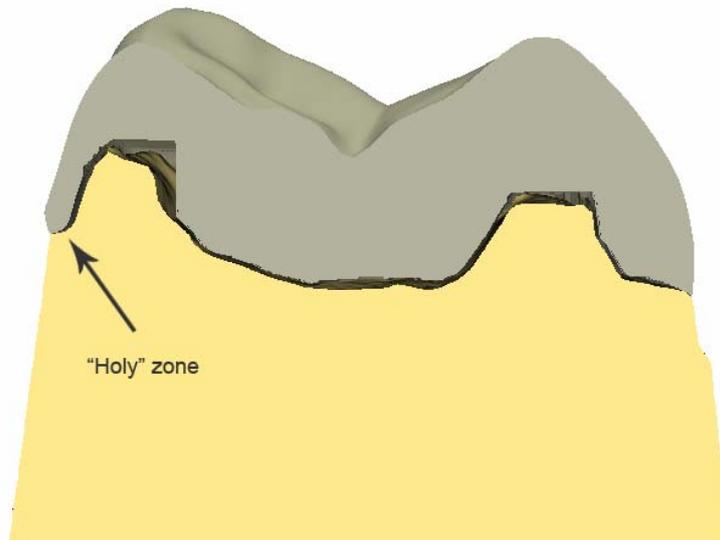


Fig. 1

As we can see in the example below the Step bur milling mode will always sacrifice the post diameter of a traditionally prepared Endocrown rather than impinge on the ceramic in the “holy zone” (Fig. 2). When viewing the milled result the post will always look deficient.

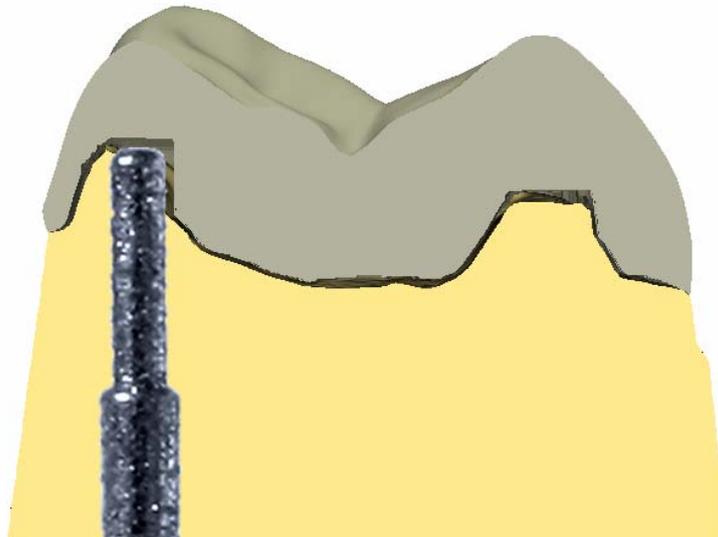


Fig. 2

Recommendation:

Ensure preparation shoulders and cusps are at least 1.0 in diameter.



Spikes

Small spikes or irregular surfaces on the Preparation Margin are handled in the following manner:

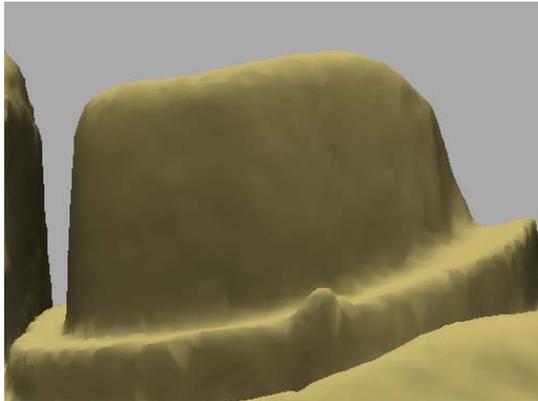


Fig. 3

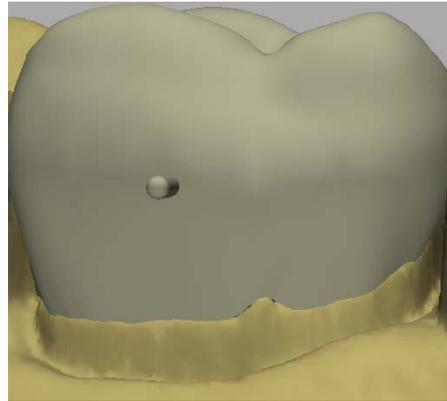


Fig. 4

The first image (Fig. 3) shows a preparation which has a “spike” on the cervical margin. The software proposes the Crown (Fig. 4).

However, the milling instrument is not able to mill such a small artefact and so the bur takes away as little material from the margin as possible (Fig. 5 and Fig. 6).



Fig. 5



Fig. 6



The result is a restoration which does not completely seat (Fig. 7). Manual adjustment might be necessary in such cases.

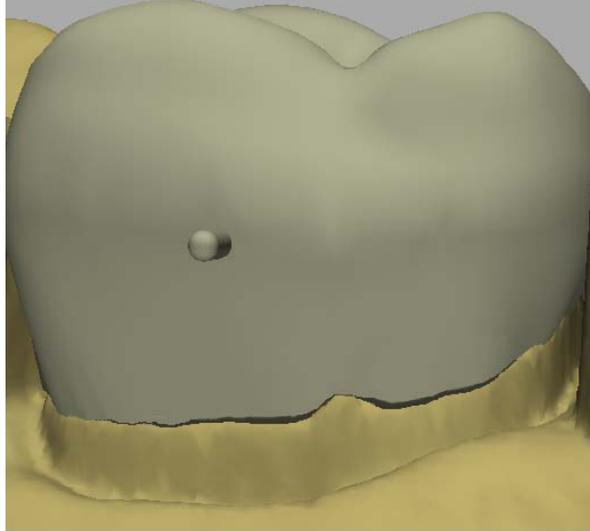


Fig. 7

Recommendation:

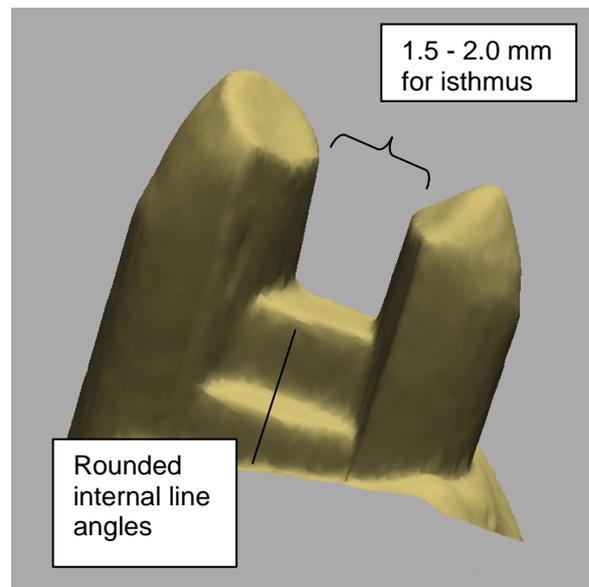
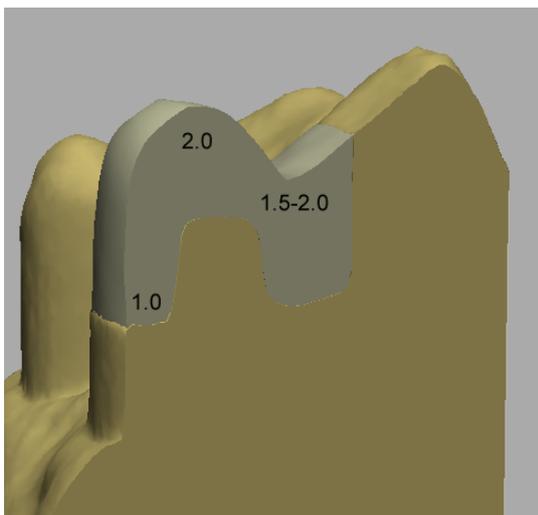
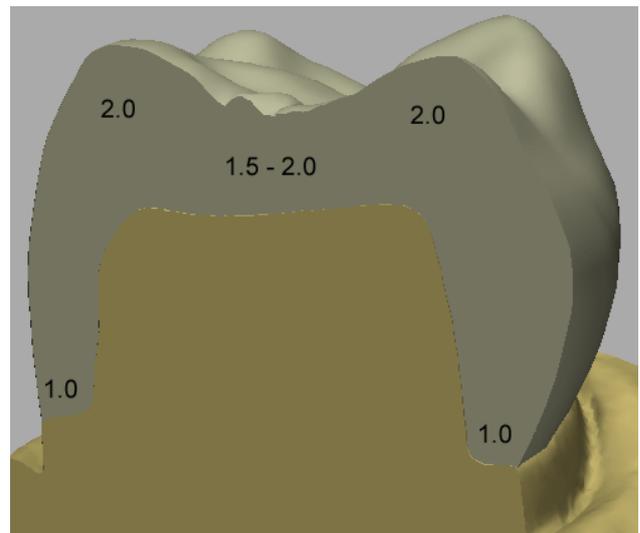
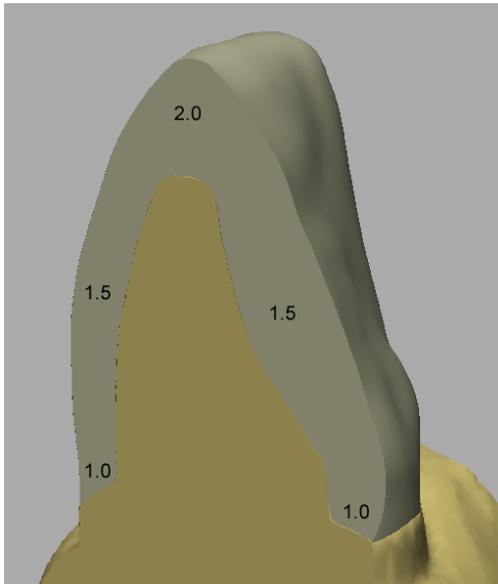
Finish all margins with a Fine or Superfine diamond such that all small defects, “bur chatter” etc, are removed.



Minimum Thickness

No preparation guide would be complete without an example of minimum recommended thickness values. With CEREC, minimum thickness should be considered within the limits of the milling instruments and the materials being milled.

The minimum shoulder thickness recommended by VITA, Ivoclar and 3M is 1.0 mm. The minimum axial wall thickness recommended by VITA, Ivoclar and 3M is 1.5 mm. The minimum thickness under a fissure recommended by VITA, Ivoclar and 3M is 1.5 – 2.0 mm. The minimum thickness under a cusp recommended by VITA, Ivoclar and 3M is 1.5 (anterior) – 2.0 mm (posterior).

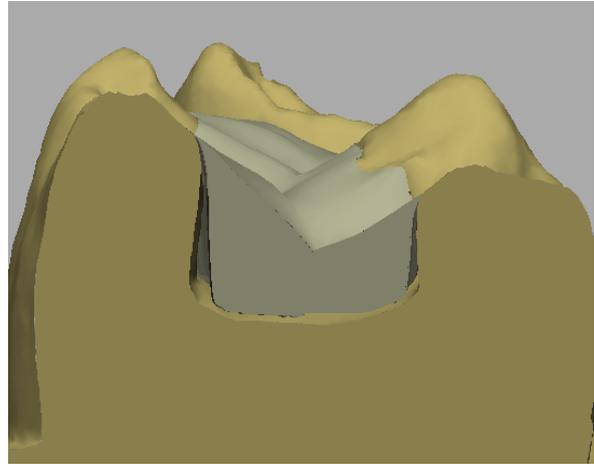


Undercuts

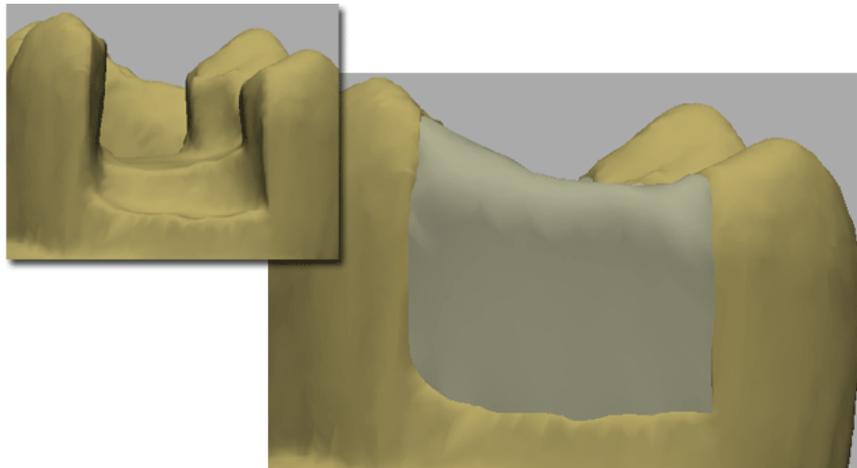
Inlays/Onlays/Partial Crowns

If one optical impression of the preparation is taken, the practitioner need never worry about a restoration not seating because of undercuts.

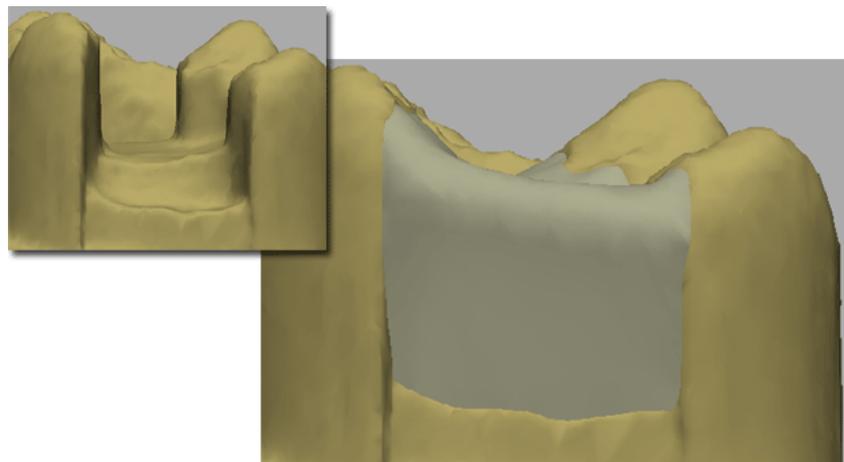
However, with the advent of multiple optical impressions, it is possible to record undercuts in the 3D software. Nevertheless, there is a safeguard built into the software: the machine will not mill (build) ceramic into an undercut, **except in the interproximal area**. Therefore, it is recommended: 1) avoid undercuts in the preparation, or 2) do not record the undercuts with multiple Optical Impressions.



In this case, three Optical Impressions were taken to capture this interproximal undercut. The software proposes (and would mill) this undercut. Note however, the undercut would only be milled in the interproximal area only – not inside the preparation!



Here is the same case, but this time only one Optical Impression was taken (directly from occlusal). The software does not "see" the undercut and consequently does not propose or mill it.

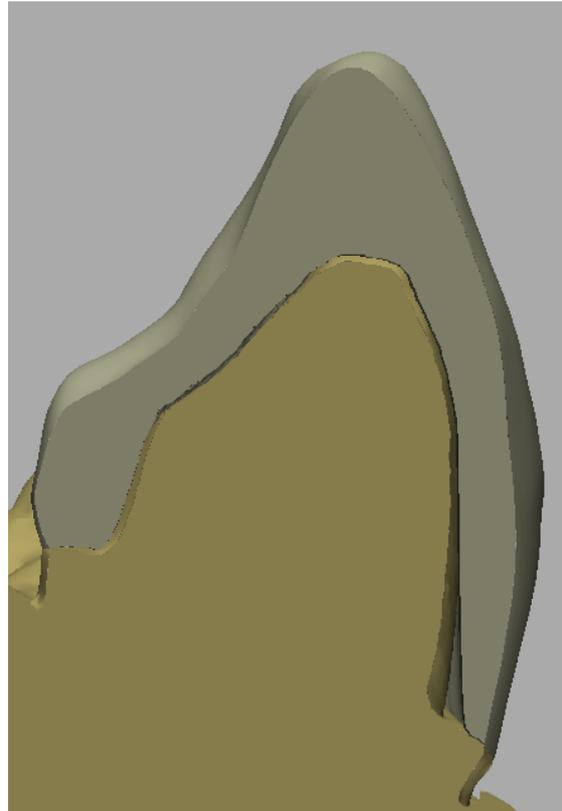




Crowns

A similar situation exists for Crowns: it is possible to record undercuts with multiple images, but the machine will not mill (build) ceramic into the undercut area.

Recommendation: If undercuts cannot be avoided during preparation of the tooth, avoid capturing undercuts during the Optical Impression stage. The user may also rectify situations like the one shown here (right) by changing the path of insertion (“Design” > “Insertion axis...”) or by only using **one** optical impression of the preparation.



Closing comments

In the end the CEREC method incorporates a mechanical milling procedure. As such, the practitioner will be rewarded when the machine is provided with clearly defined, sharp preparation margins, both at the cavosurface and cervical margins. Moreover, by imagining a 1.0 mm bur tip milling the fitting surface of the restoration at a perpendicular angle, one can take great advantage of the accuracy of the CEREC system to produce superb fitting restorations.

Happy Milling,

Your CEREC Team