A Case Study of Air Abrasion Using **KaVo RONDOflex Plus 360**

KaVo RONDOflex Plus 360 Customer's Voice

KAVO
Dental Excellence

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Brief Biography

- Graduated from Nagasaki University School of Dentistry
- Graduated from Nagasaki University Graduate School of Biomedical Sciences (Division of Oral Physiology)

Affiliations

- Japanese Society of Oral Implantology
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Making a dental prosthesis is essential in restoring the patient's masticatory function following caries treatment. Conventionally, metal dental restorations have commonly been used. However, as metal-free treatment is increasingly of interest to dentists today, treatment using hybrid ceramic and zirconia is now increasingly applied in clinical practice. Using CAD/CAM crowns for premolars by the indirect method has been approved for the Japanese National Health Insurance scheme. Following this approval, using CAD/CAM crowns for mandibular first molars was also approved for the scheme in December 2017, although certain restrictions apply.

In this issue, I will focus on sandblasting treatment, which is performed as a part of the bonding procedures essential in metal-free dental restoration. I believe that no dentists would disagree that determining the abutment size and preparing margins are critical when creating an abutment, which is an important step in CAD/CAM dentistry. The procedures involve preparation, making an impression, creating a model, and scanning the model. Following scanning, the restoration will be designed and milled. The CAD/CAM crown milled at a dental laboratory will be delivered to the dental clinic after it is confirmed that the crown fits the exact shape of the model.

Treating the Internal Surface of CAD/CAM Crowns

CAD/CAM crowns made by the indirect method undergo sandblasting treatment of the internal surface at the dental laboratory before delivery. However, the effective surface of even sandblasted crowns can be severely tainted the following contaminants: gypsum powder, when the crown is placed on the gypsum dental model; saliva, when the crown is placed in the patient's mouth to confirm whether it fits the exact shape of the tooth; and powder generated from the crown during occlusal adjustment. These kinds of contamination can lead to crown dislodgement.

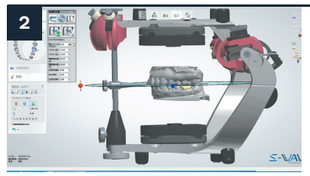
To ensure that a CAD/CAM crown will be securely bonded in place after its internal surface is treated, it is necessary to perform sandblasting treatment at the chairside. For sandblasting treatment of the internal surface of CAD/CAM crowns, oxidized alumina with a particle size of 50 µm is used. Sandblasting treatment of the internal surface of a CAD/CAM crown can not only remove contamination from the internal surface, but also increase the bonding area, and can thereby improve bonding durability.

Steps for Making a CAD/CAM Crown and Bonding it to a Left Mandibular First Molar

1

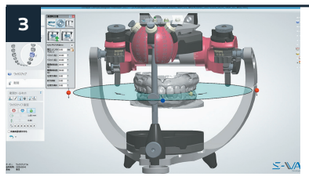
Scan the model after preparation and impression creation; design and configure a CAD/CAM crown. First, determine the direction for placement and removal, and set the finishing line.

2



A view on a virtual occlusion model.

3



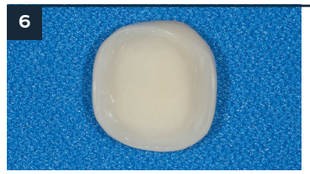
4

Design a restoration.

5

A CAD/CAM crown milled at a dental laboratory (Created by Dr Natsuhiko Amihiro at Kirara Dental Lab).

6



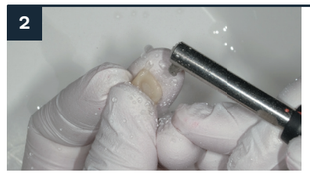
The internal surface of the CAD/CAM crown.

Bonding Steps for a Right Maxillary Second Premolar Using Zirconia

1

An image of a model. (Created by Dr Natsuhiko Amihiro at Kirara Dental Lab)

2

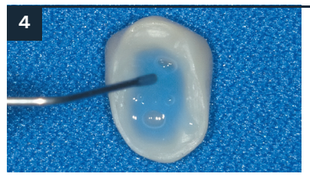


Air abrasion on the internal surface of a zirconia crown. Air abrasion is performed with oxidized aluminum applied evenly on the internal surface of the crown. An extraoral vacuum aspirator should be placed nearby, to ensure that the air in the consultation room is not contaminated.

3

The internal surface of the crown after sandblasting treatment.

4



Etching treatment for the inside of the zirconia crown. Blood is completely washed off by etching treatment. As the adhesive monomer MDP may be inhibited when etching with phosphoric acid, the package insert of the cement to be used should be read carefully.

5

The abutment after the provisional restoration is removed.

6

Air abrasion on the surface of the abutment. Spraying water helps control the particles of oxidized aluminum. It can also minimize contamination in the oral cavity. Extraoral scattering of oxidized aluminum powder can be prevented by spraying water. This procedure also prevents contamination in the consultation room.

7

Applying primer to the internal surface of the CAD/CAM crown.

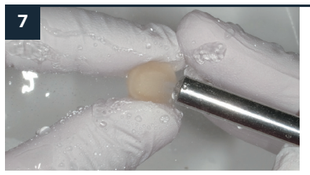
8

Filling the crown with cement.

9

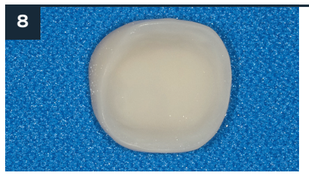
A view after a zirconia crown is bonded.

7



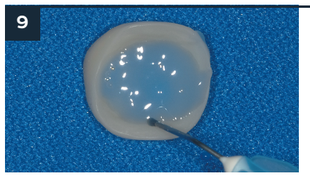
Sandblasting treatment inside the crown. Air abrasion with aluminum particles helps form a coarse surface. Improved bonding can be ensured by increasing the surface area and forming a coarse surface. This process is required as pretreatment when resin adhesive cement is used.

8



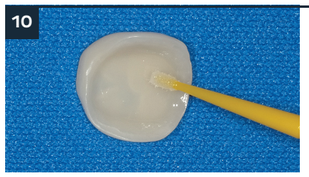
The internal surface of the CAD/CAM crown following sandblasting.

9



Etching treatment with phosphoric acid. Etching treatment with phosphoric acid helps ensure that contaminants such as saliva and plaque are removed from the crown.

10



Primer treatment inside the crown.

11

A view after the provisional restoration and temporary cement are removed. It can be seen that part of the temporary cement still remains on the distal proximal surface.

12

Sandblasting treatment on the abutment. The surface area of the abutment can be increased; temporary cement can be completely removed. It is difficult to clean the abutment with hand-held tools only.

13

Primer treatment is performed following sandblasting on the abutment.

14

It can be considered that the crown is precisely made if no contraction or expansion of the material is observed. This can be achieved provided that the formation of the abutment, preparation of the impression, and measurement of occlusion are all performed precisely. In the case presented, the crown did not require any adjustment before it was bonded to the tooth.

Table 1:

Causes of contamination inside CAD/CAM crowns

- Contamination with dust powder generated from a block being milled by a milling machine
- Contamination with a fitting material used in checking the fitting of the crown
- Contamination with a polishing material used in polishing the crown
- Contamination inside the crown with gypsum powder, which is generated from the gypsum model that comes with the crown at the time of delivery
- Contamination with plaque, saliva, blood, and exudate when the fitting of the crown is checked inside the patient's mouth

Effects of alumina sandblasting treatment

- Removal of contaminants
- Increased mechanical occlusion
- Increased bonding area
- Exposure of the filler

Keys to successful bonding

- Sandblasting treatment: It is essential to perform sandblasting treatment at the chairside prior to bonding the crown to the tooth, because crowns are always contaminated with saliva, exudate, and blood after fitting is checked in the patient's mouth.
- Phosphoric acid treatment: Use of chemicals is also required when cleaning the inside of the CAD/CAM crown, to remove proteins.
- Silane coupling treatment: Silane treatment should be performed on the silane coupling material when bonding a CAD/CAM crown in which a filler accounts for at least 60% of the total content.
- Great care is required for all of the following items: dried silane coupling materials, primer, and remaining moisture following washing. This is because all of these items can be inhibitory factors in resin cement polymerization and bonding.

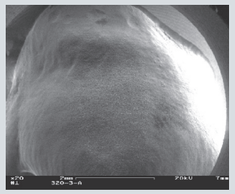
To ensure that the crown is bonded to the dentine, inhibitory factors in *Table 1* should be considered. These factors are critical even from a perspective of bonding per se. However, such inhibitory factors in bonding can be completely removed if sandblasting and ultrasonic cleaning are performed inside the crown directly before the crown is bonded to the tooth. These procedures should be performed after receiving the crown from the dental laboratory, after checking the fitting of the crown in the patient's mouth and again after polishing the tooth. It is certain that improved bonding of the crown can be achieved, and that medical incidents such as dislodgement and damage can be reduced if inhibitory factors are completely removed.

Favorable prognosis can be achieved by ensuring that steps underpinned by bonding theory are taken, and trust from patients can therefore be earned. KaVo RONDOflexPlus 360 is essential for a bonding system that addresses metal-free dentistry going forward. I am confident that every dental clinic that regularly uses KaVo RONDOflexPlus 360 can achieve increased bonding and higher patient satisfaction.

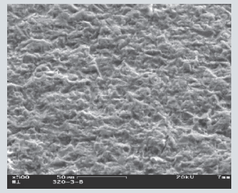
KaVo RONDOflex Plus 360

- No irritating sounds or vibration during abrasion. Effective in forming an abutment in the mouth as well as sandblasting treatment of crowns
- Air abrasion can be performed simply by attaching to a KaVo MULTIflex coupling
- Water can be sprayed simultaneously with air abrasion

Oxidized aluminum particles used for sandblasting can be controlled in sprayed water. Hence, damage to the adjacent teeth, gingiva, and oral mucosa can be reduced.



A view of the tooth surface onto which powder with a particle size of 50 µm was sprayed for 60 seconds.



An even, coarse tooth surface at 500-fold magnification.

Containers with corundum powder with particles with the size of 27 µm and 50 µm.

Two cannula sizes (0.46 mm, 0.64 mm) and two injection port sizes (90°, 110°) are available, enabling access to hard-to-reach areas around molars.

References

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