Air Abrasion of Zirconia Resin-bonded Fixed Dental Prostheses Prior to Adhesive Cementation: Why and How?

Mutlu Özcan

IAAD WORKING INSTRUCTIONS

Air Abrasion of Zirconia Resin-bonded Fixed Dental Prostheses (RBFDP) Prior to Adhesive Cementation: Why and How?

During try-in of zirconia RBFDP, contact of the cementation surface with the plaster model, saliva, disclosing medium, grease of the fit-checker, and all other possible contaminants can best be removed using air abrasion. This procedure also slightly roughens the surface and contributes to micromechanical retention of the resin cement to the cementation surface. Yet the air-abrasion protocol should be applied gently, considering the particle type, pressure, distance, and duration.

CAUTION! To obtain a clean surface for better adhesion, create a moderately rough surface and at the same time avoid monoclinic phase formation on zirconia, which is theoretically detrimental for its fatigue properties, delicate application of air-abrasion procedures is required.

REFERENCES


Correspondence: Professor Mutlu Özcan, University of Zürich, Dental Materials Unit, Center for Dental and Oral Medicine, Clinic for Fixed and Removable Prostodontics and Dental Materials Science, Zürich, Switzerland.

Do | Why?
--- | ---
Try-in zirconia RBFDP. | CAD/CAM reconstructions may not fit as ideally as gold restorations. Depending on the system employed, optical scanning and milling procedures may create non-fitting surfaces.
Check the fit of the RBFDP using silicone-based materials. | Materials such as Fit-Checker show the areas that do not fit well. At this stage in non-ideal situations, the restoration can be renewed.
Remove silicone; wash, rinse, and dry thoroughly. | Silicone artifacts penetrate into the surface irregularities of zirconia. Washing and rinsing can initially remove these artifacts.
Mark the area to be air abraded with a pencil. | Since the color of the sand is whitish like zirconia, it is difficult to see where the particles are deposited. Marking will allow controlled air abrasion.
Coat the veneering part of the RBFDP using glycercin gel. | Accidental deposition of particles on the veneering ceramic may remove the glaze.
Air abrade the cementation surface using a chairside air-abrasion device. | Air abrasion of the cementation surface cleans contaminants from the surface and roughens zirconia. Etching with hydrofluoric acid is not effective, as zirconia does not contain a silicon dioxide (silica) phase. The operator has control when air abraison is performed chairside.
Particle type: Alumina particles coated with silica or silica only. | The particle morphology of alumina particles presents a more amorphous pattern than silica-coated alumina particles or silica particles only, where the latter does not yield subsurface cracks.
Particle size range: 30 to 50 μm. | Particle size above this range increases the monoclinical phase, which may impair fatigue resistance of zirconia.
Blasting pressure range: 0.5 to 2.5 bar. | Blasting pressure should be as low as 0.5 bar. However, air abrasion even at 2.5 bar does not increase the monoclinical phase to the critical value as stated in the ISO norm.
Duration: Approximately 20 s for an area of 10 mm until pencil mark vanishes. | Zirconia is a hard material. It takes time to create a rough surface.
Distance: Approximately 10 mm. | Holding the nozzle close to the surface creates hollow pits on the surface. The nozzle distance of approx. 10 mm allows the particles to abrade the surface over a larger radius.
Motion: Circling motion, rotating the nozzle. | If the nozzle is not moved in circling motions, the surface is not evenly roughened.
Ultrasonic cleaning of the RBFDP in ethanol for 10 min. | The remnants of loose particles after air abrasion may impair wettability of the silicone or the primer and the subsequently applied adhesive resin. Ultrasonic cleaning eliminates such remnants best.