

Why Porcelain Breaks and Chips

Ten Factors to Consider in the Restorative Process

The fracturing of porcelain is most often related to one of these ten factors. Having a thorough understanding of the masticatory system is critical for obtaining a predictable result. The Dawson Philosophy of Complete Dentistry teaches a protocol for producing healthy tissues, restorations that can be easily and thoroughly cleaned by the patient, occlusal contacts in harmony with the masticatory system and optimum esthetics.



Figure 1. Properly adjusted occlusion, exhibiting equal intensity contact on all teeth.



Figure 2. Correct lateral anterior guidance should exhibit no posterior contacts during excursive movements.



Figure 3. With any protrusive movement of the mandible, the goal is immediate posterior disclusion.



Figure 4. The maxillary lateral incisor is the most common anterior esthetic restoration to fracture when the occlusal scheme is not perfected.

1. Properly Designed Centric Stops

Equal intensity centric holding contacts distribute forces equally through out the mouth. The centric stops also create vertical and horizontal stability of the teeth. For posterior teeth, the goal is a cusp-fossa occlusal relationship (*figure 1*). A porcelain restoration that is left high or with a poorly designed stop will lead to porcelain that is overloaded. Often the first sign of occlusal instability of an all-ceramic restoration is fracture.

2. Correct Lateral Anterior Guidance

When the mandible moves laterally, the goal is to have immediate disclusion of the posterior teeth on the working and balancing side (*figure 2*). When posterior teeth are allowed to contact in excursive movements, increased muscle activity, combined with the increased mechanical stress contributes to increased chance of fracture. Creating the correct contour on the lingual of the maxillary canines is one of the most important decisions a clinician makes during the restorative process. If the cuspids are too steep for the patient's functional pattern, fracture, mobility or migration is likely.

3. Correct Protrusive Anterior Guidance

The goal of any protrusive movement of the mandible is immediate posterior disclusion (*figure 3*). As the mandible moves forward, the goal is to have equal contact of the leading edge of the lower incisors from the centric stop to the maxillary incisal edge. Balancing the protrusive load over the lingual contours of the central and lateral incisors is key to the comfort and stability of anterior esthetic restorations.

4. Correct Crossover Disclusion

It is not by chance that the most common anterior esthetic restoration to fracture is maxillary lateral incisors. Proper occlusal design dictates a smooth transition to the incisal edge of the maxillary centrals as the patient moves beyond the cuspid in lateral excursion. When this positioning is overlooked, excessive loads can be placed on the distal of the lateral incisors, leading to fracture (*figure 4*).

5. Lingual Contours In Harmony With The Envelope Of Function

Protecting the posterior teeth from contact in excursive movements is one of the most important functions of the anterior teeth. Some patients' functional patterns are steep while other patients' are more horizontal. Signs of instability such as wear, fremitus or migration of the anterior teeth are all signs a constriction could be occurring (*figure 5*).

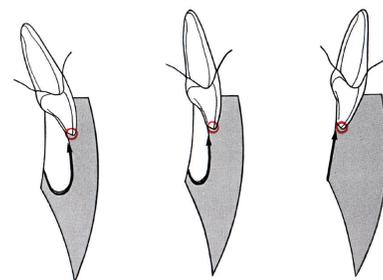


Figure 5. Location of the exact incisal edge position is second in importance only to centric relation.



Figure 6. Forces that produce wear facets in natural dentition will result in fractured porcelain. If it is determined that the parafunction occurs while the patient is asleep, a night guard should be fabricated.



Figure 7. Preparation reduction guides are created from the diagnostic wax up and ensure the reduction goals are met.



Figure 8. Sharp line angles and rough preparations are major contributors to fractured porcelain in final restorations.



Figure 9. To avoid fractures, follow the manufactures specs for adhesive materials exactly.

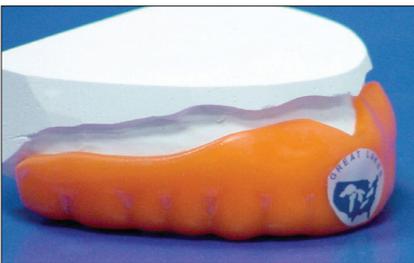


Figure 10. Fabricated sports guard.

6. Parafunction

Bruxism, nail biting, sleep disturbances, chewing on pencils/pens, or any aberrant movement of the mandible that brings the teeth together in an abnormal pattern and creates signs of instability in any part of the system must be identified during treatment planning (figure 6).

7. Properly Designed Tooth Preparation

One of the most common causes of fracture is over reduction of the incisal edge. Proper treatment planning with mounted diagnostic casts, photographs, radiographs, and a complete exam process allows the restorative team to create a three-dimensional diagnostic wax up for creation of preparation reduction guides (figure 7).

8. Properly Finished Tooth Preparations

When a sharp line angle is left on a preparation, it will not get transferred properly to the die, leading to a porcelain restoration with a rounded internal surface abutting the sharp line angle. This abutment creates tremendous stress on the porcelain substructure, and when combined with poor occlusal management, may lead to fracture (figure 8).

9. Meticulous Adhesive Technique

Poor attention to detail during the delivery phase of all ceramic restorations is a major cause of postoperative discomfort and fracture (figure 9).

10. Trauma

The use of a sports guard, like the one shown from Great Lakes Orthodontics (figure 10), should be provided for the patient with leisure or job-related activities that pose a risk to the dentition.

While fractured porcelain is a sign of instability that a patient is acutely aware of, tooth mobility, tooth migration, tooth wear, sore musculature and temporomandibular joint issues also can be a consequence if occlusion is not meticulously addressed. The Dawson Philosophy provides a step-by-step process to provide outstanding esthetic results with a tried and true approach to providing occlusal stability.

“When these principles are followed, they will guide the restorative team in providing the patient with restorations that are contoured properly to live in harmony with the joints and muscles.”

~ John Cranham, DDS