Enamel wear and Dental Ceramics: An Update
By Bobby Baig

Introduction:
1. The wear of tooth structure caused by opposing restorative material is often a critical concern when selecting a restorative material for any given clinical restorative treatment.
2. Ideally, a restorative material that replaces enamel should have wear characteristics similar to enamel.
3. According to Seghi et al. such a material should wear at the same rate as enamel and should not cause more wear of the enamel it opposes than the enamel itself would.
4. The proper selection of restorative materials is important to preserve function, esthetics and occlusal harmony.
5. The wear of dental hard tissue is a natural and unavoidable process. Wear is a progressive phenomenon in oral cavity characterized by loss of the original anatomical form. This process may result from physiological or pathological conditions.
6. Excessive wear results in unacceptable damage to the occluding surfaces and alteration of the functional path of masticatory movement.
7. It may also destroy anterior tooth structure that is essential to acceptable anterior guidance function or esthetics, resulting in increased horizontal stresses on the masticatory system and associated temporomandibular joint disorders.

Newer Ceramics and Enamel Wear:
1. Advances in CAD/CAM systems, the development of new high strength ceramics and the increasing cost of noble metals have all contributed to the increasing popularity of all ceramic restorations.
2. From 2008 to 2014, Glidewell Laboratories reported increasing the percentage of all ceramic fixed prosthesis cases from 23.9% to 80.2%.
3. The reported incidence of veneer chipping with bilayered ceramic restorations prompted the emergence of monolithic, complete-contour restorations fabricated from high strength ceramics like zirconia and lithium disilicate.
4. Most laboratory studies have concluded that the wear of enamel opposing zirconia and lithium disilicate is less than that of veneering porcelain and relatively equivalent to enamel–enamel wear.
Recent Studies on High Strength Ceramics and Enamel Wear:

1. **Esquival-Upshaw et al 2013**: Lithium disilicate, either polished or glazed following adjustment, caused less wear to opposing teeth than veneering porcelain after 3 years. Quantitative measurement of wear in that study revealed no difference between teeth opposing natural teeth or lithium disilicate crowns.

2. **Etman et al 2008**: Showed less wear on enamel opposing veneering porcelain (106 μm/1 yr and 156 μm/2 yr) than adjusted and polished lithium disilicate (149 μm/1 yr and 214 μm/2 yr).

3. **Stober et al 2014**: Measured enamel wear opposing zirconia that was polished, glazed, adjusted and repolished in a 6 month clinical study. They found more wear on teeth opposing zirconia crowns (33 μm/6 mo) than teeth opposing natural teeth (10 μm/6 mo).

4. **S.P Passos et al 2014**: Confirmed in this systematic review that polishing zirconia leads to less opposing enamel wear than glazing. The 30–50 μm glaze layer is worn off by opposing enamel, causing enamel abrasion in the process.

5. **V. Preis et al 2013**: Determined that polishing lithium disilicate and zirconia following adjustment showed a trend towards lower wear on a steatite antagonist than glazing following adjustment.

6. **Al-Hiysat et al 1997**: Suggested that it is necessary to glaze or polish porcelain following adjustment to reduce opposing enamel wear. In their study, porcelain which was adjusted with a fine diamond bur produced more enamel wear than glazed or polished specimens. The mechanism of wear of veneering porcelain, however, is different than that of high strength ceramics like lithium disilicate and zirconia. Veneering porcelain fractures during wear and creates sharp asperities on its surface which abrade opposing enamel. Additionally, the fractured fragments of porcelain may act as third-body particles, further potentiating the wear process.

A) High strength ceramics, however, are less likely to fracture and therefore maintain a smooth surface during wear.

B) Therefore, the lower enamel wear observed against polished and glazed porcelain in laboratory studies may reflect a delay in the wear of opposing enamel. Once the smooth surface layer of glaze or polished porcelain is roughened and worn through, the polished or glazed porcelain will likely wear at the same rate as adjusted porcelain.

In summary, previous clinical recommendations for porcelain may not apply to high strength ceramics.

**Enamel Wear Adjusted with Diamond Bur-Polished and/or Glazed:**

**Nathaniel C. Lawson et al 2014**:

There has not been a study comparing enamel wear against lithium disilicate and zirconia that has been adjusted with a diamond bur and then polished or glazed.

This study measures the wear of enamel against adjusted, adjusted and polished, and adjusted and glazed zirconia and lithium disilicate.

**Materials:**

1. Zirconia (LAVA, 3M ESPE)
2. Lithium disilicate (IPS e.max Press, Ivoclar Vivadent)
3. Veneering porcelain (Ceramco 3, Caulk Dentsply)
4. Enamel

**Test Groups:**

LAVA and e.max specimens were further divided into groups.

(A): Adjusted
(AP): Adjusted and polished
(AG): Adjusted and glazed
Results:
1. Polishing zirconia following adjustment with a fine diamond bur creates less opposing enamel wear than glazing it.
2. Polishing and glazing lithium disilicate following adjustment produced statistically similar opposing enamel wear.
3. Covering a restoration with veneering porcelain significantly increases opposing enamel wear, in fact it was the only substrate which produced more enamel wear than enamel–enamel contact.

Conclusion/Summary:
1. Zirconia is more wear resistant than lithium disilicate.
2. Polishing zirconia following adjustment causes less wear of opposing enamel than glazing it.
3. Glazed and polished lithium disilicate cause similar enamel wear.
4. The results of the study suggest that it is preferable to polish zirconia and lithium disilicate that have been adjusted with a fine diamond to make them wear compatible with enamel.

Reference: