

## **Examination of the mechanical properties of Zirconia and Porcelain blocks after grinding with smooth and coarse diamond burrs**

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Introduction: Porcelain and Zirconia are widely used materials in oral rehabilitation for fixed partial dentures, FPD. Among many important properties, A FPD should be able to resist bite forces, the harsh oral environment and remain intact for a long period of time. When coming back from the dental laboratory, the mechanical properties of the FPD are optimal. but it is not uncommon for the dentist to perform a machining procedures on the restoration in order to achieve good fitting to the prepared teeth. In most cases these modifications are made using "high-speed" dental hand piece, and diamond burs. The surface integrity of the restoration is an important parameter that influences on the restoration strength and durability. The more smooth the restoration surface is, it is less prone to fracture, and is less prone to coloring and plaque retention. Therefore, every modification the dentist makes on the restoration is not recommended. In some cases, the adjustments are made on a FPD which is already cemented to the teeth. If the teeth are vital, the implications of the machining of the restoration are even more destructive. As a result of the friction between the bur and the restoration, the temperature rises. There is a risk of pulp necrosis in temperature above 42°C. The purpose of this study is to compare the mechanical properties of Zirconia and Porcelain blocks after grinding with smooth burs made in a new technology, "Magic touch<sup>®</sup>", Strauss<sup>®</sup> co. (Ranana, Israel) and coarse burs.

Materials and Methods: blocks of Porcelain MARK II for CEREC<sup>®</sup> (VIDENT), and Zirconia IPS e.max ZirCAD (Ivoclar Vivadent) were sliced to slices of 1mm and underwent drilling using the two kinds of burs, using thermocoupling- Almemo, Holzkirchen, Germany. so that the rise in temperature was measured through the drilling. Blocks of Porcelain and Zirconia were machined with the two kinds of burs, and their surface roughness was examined with MITUTOYO SURFTEST-402 – PROFILOMETER. Further examination was made with SEM micrographs.

Results: the samples machined with "magic touch" burs, both on Porcelain and Zirconia, were significantly smoother than the samples machined with coarse burs ( $P \leq 0.05$ ). there was no significant rise in temperature (above 42°C) using both kind of burs, on both Porcelain and Zirconia.

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Conclusions: "magic touch" diamond burs, enables the dentist to perform fit adjustments on Porcelain or Zirconia FPD, leaving the restoration with minimum surface roughness, without elevating the temperature to high values, permitting both the tooth and the restoration to remain strong and durable for a longer period of time.