



H A V E N G R E E N C L I N I C

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Zirconia crowns.

Natural tooth coloured, and healthy.

Zirconia is a relatively new material in dentistry. Its introduction is probably the biggest advance since the advent of bonded porcelain. The first tooth-coloured crowns were covered, usually only on the outer side, with plastic retained by a retentive metal mesh. The ability to bond onto precious and non-precious alloys greatly enhanced the appearance and strength of crowns and bridges. With the development of Zirconia we now have the option to provide metal-free crowns. [see the end of this article for the science]

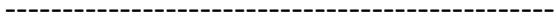
Zirconia has several advantageous properties which makes it very suitable for dental crowns. It is **biocompatible** i.e. it is healthy for the adjacent tissues, and it is not adversely affected by the oral environment.

Zirconia is a **poor conductor** of heat so it is less likely to transmit hot or cold stress to the underlying tooth than a metal crown.

Zirconia is **less plaque adherent** than most other dental materials, so it is one of the least irritant materials we use. This reduces the tendency for recession of the gum away from the crown margin. All metal oxidises to a certain extent causing discolouration and recession at the crown margin. Zirconia metal-free crowns will eliminate this disadvantage.

Zirconia is **exceptionally strong** allowing it to form the framework for crowns and bridges without the need for metal. Like all materials, it is technique sensitive, requiring specific design to recognise its characteristics, to obtain the best results. However Zirconia is good enough for one company, 3M, to give a life-time guarantee on cases it accepts for manufacture!

In our practice we use conventional impressions to supply laboratory prescriptions because they achieve more accurate results than in-surgery electronic scanning. Laboratory scanners are more accurate than in-surgery scanners and laboratory mills are also superior. As the technology is improving all the time we will keep this decision under review. [see technical explanation in scientific information]



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SCIENTIFIC INFORMATION ABOUT ZIRCONIA.

ZIRCONIA , Zirconium dioxide Zr O2 is a white crystalline oxide of zirconium, not to be confused with Zircon, an element. Its most naturally occurring form, with a mono clinic crystalline structure, is a rare mineral, **Baddeleyite**, which is mined. Other rarer forms exist and are used as gemstones and artificial diamond.

Zirconium dioxide, Zr O2 is one of the most studied [ceramic](#) materials. Pure ZrO2 has a [monoclinic crystal structure](#) at room temperature and transitions to [tetragonal](#) and [cubic](#) at increasing temperatures.

The volume expansion caused by the cubic to tetragonal to monoclinic transformation induces very large stresses, and will cause pure ZrO2 to crack upon cooling from high temperatures. Several different oxides are added to zirconia to stabilize the tetragonal and/or cubic phases: [magnesium oxide](#) (MgO), [yttrium oxide](#) (Y2O3), [calcium oxide](#) (CaO) and [cerium \(III\) oxide](#) (Ce2O3) amongst others. These improve strength.

As the **refining process is very complex**, there is scope for quality variation in brands and hence variations in cost.

Lava, the brand of 3M is currently the most expensive. To create the milling blocks unilateral or isostatic pressure is used.

Zirconia is normally used as a **sub frame** for crowns and bridges which are then **veneered with feldspathic porcelain**. Cheaper versions are not veneered.

Relative Strengths:

Zirconia	900 Mega Pascals.
Alumina Porcelain	600 Mega Pascals.
Vita Inceram	550 Mega Pascals.
Empress 2	300 Mega Pascals.
Empress 1	120 Mega Pascals _

These ceramic materials lose up to 40% of their starting strength with time. This is thought to be due to **solubility** or **fatigue** from repeated loading. The latter is the more probable cause.

550 Mpa. is regarded as an ideal minimum strength for crowns and bridges so only Zirconia is strong enough for a long term guarantee.

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