The question has arisen over the years, especially as the dental materials have rapidly evolved; is there an ideal restorative material? The question can only be answered when the requirements of the restoration are addressed. The first question would be based on aesthetics and whether the restoration needs to look like a natural tooth or not. If not, there will certainly be more options. Considering that the quest for tooth-colored restorations has drastically increased in the past decade, the search for the ideal restoration must include the material’s ability to mimic natural dentition. Although obviously subjective, the merits that are considered during evaluation are:

**Aesthetics** – Can it look like a natural tooth and provide high aesthetic value?

**Strength and durability** – Can it be used in both the anterior and posterior portions of the mouth? Will it provide the strength necessary to replace cusp tips and incisal edges?

**Bondability** – Can the material be “adhesively” bonded to resin cement and the underlying tooth to enhance retention and improved marginal seal?

**Wear compatibility** – Will the material provide adequate wear resistance without destroying the opposing natural tooth structure?

**Marginal integrity** – Will fabrication techniques provide excellent marginal adaptation?
**Conservative preparation options** – Can the material be used for intra-coronal as well as extra-coronal applications? Can the material be fabricated in minimal thickness to save existing healthy tooth structure?

**Ability to use different cementation options** – Can the restoration be cemented traditionally, rather than requiring "technique-sensitive" adhesive bonding techniques?

As the traditional restorations are reviewed – porcelain-fused-to-metal, gold, zirconium-oxide supported, aluminum-oxide supported, leucite-reinforced, and lab-processed resin – each one presents with compromises that limit it from being "ideal." There is, however, a new material. IPS e.max appears to meet more of these requirements than other materials and as more clinical and scientific studies emerge, it might eventually emerge as the "ideal."

IPS e.max is lithium disilicate with a unique crystalline structure that mimics the aesthetics of natural dentin and enamel combined with a flexural strength greater than any other all-ceramic system on the market today. Further exploration of e.max lithium disilicate reveals the following:

**Aesthetics** – The crystalline structure of lithium disilicate yields very high aesthetic value that provides excellent results for both anterior veneers or crowns (Figs. 1-4), as well as natural appearing posterior full coverage restorations (Figs. 5 & 6).

**Strength and durability** – The flexural strength of e.max lithium disilicate is between 360-400mPA, which is approximately two to four times more durable than all other ceramic systems on the market. Studies have shown that the lithium disilicate material is the strongest all-ceramic system available and yields clinical success superior to porcelain-fused-to-metal crown.1,2,3 This material, whether used as a monolithic full coverage crown in the posterior or as an anterior restoration increasing length with worn dentition, is ideal to use in high stress situations. This increased strength, compared to other ceramic systems, also allows for the use of e.max for anterior three-unit bridges and anterior cantilever bridges with missing lateral incisors (Figs. 7 & 8).

**Bondability** – The ability to adhesively bond to a restorative material provides not only increased retention, but will also yield improved marginal sealing. The e.max lithium disilicate can be etched using hydrofluoric acid, which can then be silanated and bonded using current dentinal adhesive agents and resin cements. This allows this material to be used in conservative, tooth-strengthening posterior restorations and also for anterior veneers where traditional retention and resistance form is non-existent. This increased retention also offers significant advantages for short clinical crown preparations in posterior teeth.

**Wear compatibility** – Studies have shown that both in vitro and clinically, the wear of lithium disilicate is lower against opposing enamel than many commonly used ceramic materials and is comparable to enamel against enamel wear.4,5 Not only will this provide a restoration that will provide long-term occlusal stability, but will also
allow the use of e.max in situations where there is opposition against natural dentition such as canine veneers and crowns during laterotrusive movements where there has always been a concern about long-term wear of the opposing enamel.

Marginal integrity – The fabrication process of e.max lithium disilicate promotes ideal marginal integrity. These restorations can either be fabricated using the “lost wax” process used with gold and leucite-reinforced ceramic (IPS Empress) or using CAD/CAM technology. Both of these techniques yield improved marginal integrity over traditional powder-liquid ceramic build-up techniques used with other systems. Studies have shown “gold-like” marginal results with these techniques. The hardness and strength of the lithium disilicate also allows improved marginal finishing techniques by the ceramist yielding more accurate margination.

Conservative preparation options – Studies have shown that intra-coronal bonded restorations can actually have “tooth-strengthening” properties that are superior to non-adhesively bonded restorations. This advantage allows “bondable” ceramics to be used as intra-coronal and single-cusp restorations where other materials would warrant more aggressive, extra-coronal restorations (Figs. 9, 10, 11 & 12). With the increased popularity of more conservative and even “prepless” veneers, the need for materials that will provide aesthetic restorations in very thin applications (0.2-0.3mm) becomes increasingly important and e.max lithium disilicate meets these requirements (Figs. 13 & 14).

Cementation options – Due to the increased strength of the lithium disilicate, this material allows for either adhesive/resin cementation or traditional cementation using non-adhesive techniques. This quality is especially desirable when placing a full coverage restoration in an area where complete isolation might be difficult, such as with second molar restorations. Self-etching resin cements, resin ionomers and even glass ionomers can be used with the lithium disilicate restorations, as long as adequate retention and resistance is achieved with preparation design.

Although there might not be a perfect replacement for dentin and enamel; research, development and creative applications of new materials have given dentistry some options to overcome the inadequacies of traditional alternatives. e.max lithium disilicate might not be our final solution, but it is closer than anything we have seen in the past and will only open up opportunities for enhanced treatment options in the future.

References:
1. Mouth Motion Fatigue and Durability Study. Petra C Guess, Ricardo Zavanelli, Nelson Silva and Van P Thompson, NYU
2. Dental Advisor, “4-Year Clinical Performance: IPS e.max,” June 2010, Volume 27, No. 05
4. IADR 2009 General Session, Miami, Florida Abstract #1009