Esthetic posts - An update

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ABSTRACT
The primary function of corono-radicular post is to provide retention for a core and this is essential for the longevity of restorations placed on endodontically treated teeth. Individually, cast metal post and core has been a commonly used technique in the past to improve the retention of crowns and bridges on nonvital teeth. Root filled teeth with fractured or discolored coronal aspects often need to be restored, invariably with crowns. Often for mechanical reasons, the abutment has to be reinforced by a post and core system. Metal posts and cores are normally used, because of their superior physical properties. Nevertheless their metallic color poses a problem - aesthetics in anterior all ceramic restorations are compromised, particularly when a high lip-line or a broad smile reveals the entire restoration. Use of post system for the rehabilitation of endodontically treated teeth requires traditional planning for the function of the restoration as well as a structural and aesthetic strategy for novel technologies in ceramic and composite. The use of bondable materials allows the practitioner to unify the structure and morphology of root systems to provide creative solutions to challenges heretofore unmet. Ceramic post-and-core systems offer biocompatibility, aesthetics, reinforcement of the remaining root, and prosthesis retention. Aesthetic posts and cores contribute to the optical properties of the overlying restorations when metal-free crowns are used. With the increasing use of anterior all ceramic restorations to meet aesthetic needs, there is a need for tooth colored posts and cores, that are as good as if not better than their metallic non-aesthetic metal counterparts.

Health arguably is mankind’s most precious gift. However when we are healthy we would like to rate our looks very high. Only beauty is a phenomenon that cannot be measured. Today’s patients not only expect us to provide them with healthy teeth, healthy periodontium and an undisturbed neuromuscular function, many also desire beautiful teeth. The esthetic services must be offered in a novel way and must be actively sold. A dynamic internal and external marketing concept is part of this new dentistry. We don’t need product marketing but we do need promotion of services. In short we the dentists also sell beauty as a service.

A beautiful smile can be a decisive factor during the critical moment of a first meeting. Our marketing efforts must show the patients that we are concerned about their needs and have superb techniques available with which we can help them achieve their goals.

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crowns and bridges on endodontically treated teeth.

Traditional planning is required for installing a post system for the rehabilitation of endodontically treated teeth basically for the function of the restoration as well as a structural and esthetic strategy for newer and highly recommended technologies in ceramics and composites.

At the present time, esthetic is the top priority of majority of the patients coming to our clinics. Metal posts and cores are normally used, because of their superior physical properties. Nevertheless their metallic color poses a problem - aesthetics in anterior all ceramic restorations are compromised, particularly when a high lip-line or a broad smile reveals the entire restoration.

Utilization of contemporary post and core systems has facilitated the esthetic restoration of endodontically treated teeth. Light transmission and biocompatibility have been enhanced by the introduction of metal free post systems. However, the periodontal and endodontic status, root length and histological structures of the endodontically treated teeth must be considered in order to achieve successful restoration following endodontic treatment. The use of bondable materials allows the practitioner to unify the structure and morphology of root systems to provide creative solutions to challenges heretofore unmet. Ceramic post-and-core systems offer biocompatibility, aesthetics, reinforcement of the remaining root, and prosthesis retention.

Aesthetic posts and cores contribute to the optical properties of the overlying restorations when metal-free crowns are used.

With the increasing use of anterior all ceramic restorations to meet aesthetic needs; there is a need for tooth colored posts and or cores that are as good as if not better than their metallic non-aesthetic metal counterparts.

The major advantage of non metal posts is the technique for removing them in the event of fracture or need for endodontic retreatment is simple than that needed to remove metal posts. Apart from the esthetic advantage, the metal free posts have no corrosion and extremely biocompatible. However the major reason for clinicians to turn to metal free posts is esthetics. Esthetic concerns have led to the use of posts that are white and/or translucent. Several studies have indicated that metal free restorations provide increased esthetics and improved material strength. The disadvantages of non metal posts also have to be taken note of. Metal posts have a well established record of successful clinical service. High success rates have been reported from retrospective studies over periods of time that have not yet been matched by non metal posts. Also the cast metals have greater strength in thin sections than the composites adjacent to the posts. This allows for the production of ferrules which is not possible with non metal posts. However, metal posts are visible through the more translucent all ceramic restoration and even with less translucent restoration may cause the marginal gingivae to appear dark.

Where all- ceramic restorations are used, a metal core will alter optical proportions of overlying restoration. A number of techniques have been described to mask the metal core, all of which involve further technical steps and varying degrees of success. However masking the core alone will not alter root discoloration.
NEW DIRECTIONS FOR CORE MATERIALS

Most new materials being used for core build up are polymer based. LU XACORE (Zenith), CORE RESTORE (Ven), BISCO RE (Bisco), FLUOROCORE (Dentsply). Incorporation of titanium powder into a composite core material has also emerged as a direct core technique [Ti-Core].

ALTERNATIVES TO METAL POSTS

For many years, metals, whether cast or prefabricated have been used exclusively to construct posts as foundations for in-direct restorations. Developments in composite and ceramic materials have resulted in the introduction of metal-free posts as alternatives.

Classification of Metal Free Alternatives:

- Based on composition

  - COMPOSITE MATERIALS

  - CERAMICS

Composite materials composed of fibers of CARBON or SILICA surrounded by a matrix of polymer resin, usually an epoxy resin.

Ceramics: The proven ability of ceramic materials to mimic appearance of tooth structure has been combined with improvements in strength and durability to permit their use in all-ceramic restorations, in situations where only metal reinforced restorations would previously have been placed. The ceramic posts are both tough and esthetic. These are available as:

1) Glass posts and cores

2) Glass infiltrated aluminous porcelain posts and cores produced,

a) Conventionally

b) Machined from blocks by computer-linked systems.

All-porcelain restorations allow direct light to penetrate. The amount of scattering versus transmission of light depends on the chemical composition of porcelain in glass matrix, the size and structure of the crystalline phase, and the processing technique. Light penetration adds a translucency to the restorations that is comparable to natural teeth even under compromised light conditions. The transillumination quality also improves the natural pale-pink appearance of the adjacent marginal gingiva. The remaining tooth structure should be observed more critically in light of the high translucency of all-porcelain crown systems. Dark and non-pleasing stumps can spoil the appearance of very translucent restorations. The drawback of any light-inhibiting core material is a shadow effect at the gumline. Even all-porcelain crowns can cause a dark gumline if their cores are too opaque and inhibit light transmission. Bleaching, opaquers, and cosmetic endodontic posts should therefore be considered.
Since the late eighties, the yttrium-oxide stabilized zirconia has been used in orthopaedics for total hip replacement. It has since been improved for dental implants and endodontic posts. Cosmetic posts allow the placement of tooth-coloured, metal-free, and translucent restorations. However zirconium posts require a special surface treatment in order to achieve a strong and permanent bond to the tooth. They are sandblasted with aluminium oxide, silanated, and cemented with a phosphate-monomer modified resin composite.

**BASED ON COMPOSITE MATERIALS**

They are composed of fibres of CARBON or SILICA surrounded by a matrix of polymer resin, usually an epoxy resin. Philosophy behind use of these materials lies in the belief that a post should mimic dentin of the root in its physical properties, distribute the stresses imposed on the restored tooth in a more favorable way and thereby reduce incidence of root fracture.

**Silica fibre posts**

Carbon fibre posts are black in color and do not lend themselves to use with all ceramic units, where they may alter the aesthetic effect. Glass fibre has now been substituted and added to the range of prefabricated posts. Physical properties of these posts remain the same as those of carbon fibre posts and they behave in almost the same way.

**AesthetiPost** (from RTD, France) retains a core of carbon fibre bundle surrounded by quartz fibres similarly arranged longitudinally.

**Aestheti Plus** also from RTD, France is composed entirely of Quartz Fibres.

More recently a Translucent Quartz Fibre post has been introduced to permit light curing materials to be used for LUTING The Lightpost.

All of those are available in diameters of 1.4 and 1.8mm and length of 22mm. More recently, “double taper” quartz posts have been introduced.

**Snowpost** from CarboTech, France - was developed originally at Switzerland by Professor Bois & colleagues. The Snow Post is composed of 60% longitudinally arranged Silica Zirconium glass fibres is an epoxy resin matrix.

**Fiber Kor post (Jeneric/Pentron)** Uses glass fibre bundled out in a resin matrix. Bundles are in turn impregnated with resin cured and precision milled. The white color of the post blends in readily with dentin eliminating the halo effect of metal or carbon fiber post underneath all ceramic restorations. Matching modules of elasticity with dentin is an advantage helping to distribute impact forces more uniformly along the prepared canal interface. Available in three diameters with size matched drills.

**Parapost Fibre White** from Coltene / Whaledent has longitudinally arranged glass fibres.

The post is essentially parallel with small steps to aid mechanical retention of the cement.

Unlike other fibre posts, the head of the Para Post Fibre White has two rounded sections - again to aid retention of the core material.

It is compatible with the existing Parapost system in shape and is available in diameters of 1.14mm, 1.25mm, 1.4mm and 1.5mm. Each post has a removable color coded ring around the head for identification.
**Glassix** from Harald Nordin, Switzerland has a braided fibre arrangement, and are available in three dimensions- parallel sided with a 3 mm conical tip and diameters of 1.2, 1.35 and 1.5mm.

**Fibrekor** from Jeneric Pentron - Unlike the other quartz fibre posts, Fibrekor posts contain a **Filled Composite** as the matrix that surrounds the fibres. Fibres are glass, arranged longitudinally and comprise 42% by weight. They have a stepped parallel shape. Available in 1 mm, 1.25mm, 1.125mm, 1.375mm and 1.5mm.

**RIBBOND POST AND CORE**

**Ribbon Fibre Materials:**
Some manufactures produce fibre ribbons to be used as a matrix for construction of direct post with retained composite as core. RIBBON Inc. have suggested that their polyethylene fibre can be used to construct a directly placed composite post & core.

Technique for placement of Ribbond Reinforcement Ribbon into the canal involves selecting either 2mm or 3mm for wide canals, wet the adhesive resin and the root canal is treated with an adhesive procedure.

The polyethylene fibers of Ribbond are plasma treated to allow the dental resin to bond to its surface.

Removal of the obturation material and a minimal amount of dentine to facilitate insertion of the ribbon is the only preparation required. One or more lengths of fibre are coated with light cure resin, folded into a V shape and around an instrument and then carried into the canal space to be cured. Additional increments are then added to complete the core build up. For this technique to work well there must be sufficient light reaching depth of post space.

**Ceramic Posts:**
The primary ability of ceramic materials to mimic the appearance of tooth structure has been combined with improvements in strength and durability to permit the use of all-ceramic restoration in situations where only metal reinforced restorations would previously have been placed. The use of ceramics to provide a core & post retention confirms the idea of using a tough but aesthetic material to support all-ceramic units without affecting their optical properties.

**Light Transmitting Posts:**
The setting reaction of self-curing cements begins rapidly on mixing and this can cause difficulty in seating posts. Ensuring complete curing and then cleaning sides of post space is difficult and can result in reduced retention or increase in microleakage.

**Intra Radicular Rehabilitation:**
Translucent Posts (Lightpost; Luscent Anchor) have been introduced in order to use light cured luting agents. This can facilitate cement placement and evaluation of post setting prior to setting.

The original purpose of light transmitting posts was to provide a means of reconstituting roots with overly flared canals caused by caries or excessive endodontic preparation, the aim being to achieve union between remaining dentine and a light cured composite, thereby restoring lost tooth structure and original strength of the root.

This technique involves inserting a luscent plastic post into a light-curing composite placed within the canal. The light transmitted down and
through the post then cures the composite. Once the composite is cured, the post is withdrawn and a matching metal or fibre post is luted with resin cement.

The light transmitting properties of translucent glass fibre posts allows them to be luted in a similar fashion as a definitive post, with or without additional composite resin root reinforcement. The plastic posts require a diameter greater than 1.5mm to achieve composite curing for depth of about 7mm.

**Twin Luscent Anchors**

**Light Transmitting Esthetic Posts**

**Esthetic**

- Twin Luscent Anchors eliminate shadows at the gingival, root and crown interface as well as through thin composite restoration. Twin Luscent Anchors reflect the surrounding colors and hues compatible with natural esthetics.

**Light Transmitting**

- Twin Luscent Anchors effectively polymerize composite within the deep confines of canals Including:
  - Large canals weakened after endodontic treatment
  - Extension of caries into the coronal portion and pulp chamber
  - Developmental anomalies
  - Trauma or over-preparation of root canal

**Monoblock Strength**

Light or dual-cure composites bond to the fiberglass-reinforced anchors and the canal wall creating a cohesive and very strong foundation

**Spiraposts** are constructed of surgical stainless steel wires twisted around biocompatible, natural-color polyfiber strands.
SUMMARY AND CONCLUSIONS

The dilemma that confronts the dentist is the area of post endodontic rehabilitation is a positive one.

Variety of products and techniques available offer practical solutions to most restorative problems.

The factors considered for post/core selection includes:
- Retention
- Stress distribution
- Resistance to root fracture
- Post fracture and
- Recently aesthetics.

Improved materials and procedures allow for the reproduction of natural appearance of teeth in anterior region with all ceramic unit crowns.

If a Prefabricated metal post is used along with all ceramic restorations, colour and opacity of the post may lead to discolouration /shadowing of both gingiva and ceramic restoration.

Metal free alternatives have been on the horizon for more than a decade now; these include carbon fibre posts and the aesthetic alternatives of quartz fibre as well as ceramic posts.

Not only are metal posts are undesirable when aesthetics is of prime consideration as in all ceramic units; but is also a problem area where corrosion products are concerned.

Biocompatibility is achieved to an excellent degree with the non-metal posts especially the ceramic, carbon fibre and quartz fibre posts.

Different specific in vitro tests for posts and cores have been developed to tentatively address characteristics of the new systems and predict their clinical behavior. Although clinical tests are time consuming, they must be performed in order to evaluate the real clinical behavior of new materials, such as posts and cores, bonding systems and luting resin cements.

Originally, fiber posts were proposed in combination with a three step bonding system (All-Bond 2) and proprietary resin cement (C&B). Recently, the so called “one bottle” adhesive systems have been proposed to simplify the clinical bonding procedure of direct restorative dentistry. The clinical indications of one bottle systems may be increasing, although little data on testing for bonding fiber posts into root canals are available yet.
The latest generation of adhesive systems provides acid etching to remove the smear layer and demineralize root dentin, so that a surface increase of dentin available for bonding is achieved and a fine network of collagen fibrils is exposed.

The infiltration of this organic network with resin monomers permits hybrid layer formation and creates resin tags with adhesive lateral branches, thus creating micro mechanical retention of the resin into the demineralized dentin substrate.

Two Randomized Control Studies indicate that fiber-reinforced composite posts outperform metal posts in the restoration of endodontically treated teeth. However, this evidence cannot be considered as conclusive. Longer term Randomized Control Studies would be desirable.

The placement of a fiber-reinforced composite post protects against failure, especially under conditions of extensive coronal destruction. The most common type of failure with fiber-reinforced composite posts is debonding.

THE FINAL WORD
Development of Biomaterials for Biomedical Applications.

One major research interest of the Biomaterials Laboratory is the development of biomimetic composite materials for orthopaedic and dental applications, using traditional braiding technologies.

Braiding technology was also applied to dental posts used in the tooth restoration process. The design requirement of stiffness change along the length was successfully achieved. This eliminates stress concentration at the root region—a problem translatable into clinical benefits, it means that the dental post made by braiding technology can achieve a functionally graded post, which is more fracture-resistant, and can stay longer.

REFERENCES
7. Mahmoud Khaled AL-Omiri, Ahmad Abdelaziz Mahmoud, Mohammad Ramadan Rayyan, O s a ma A b u - H a m m a d. Fracture Resistance of Teeth Restored with Post-retained restorations; An Overview. JOE 2010;36(9):1439-1449.