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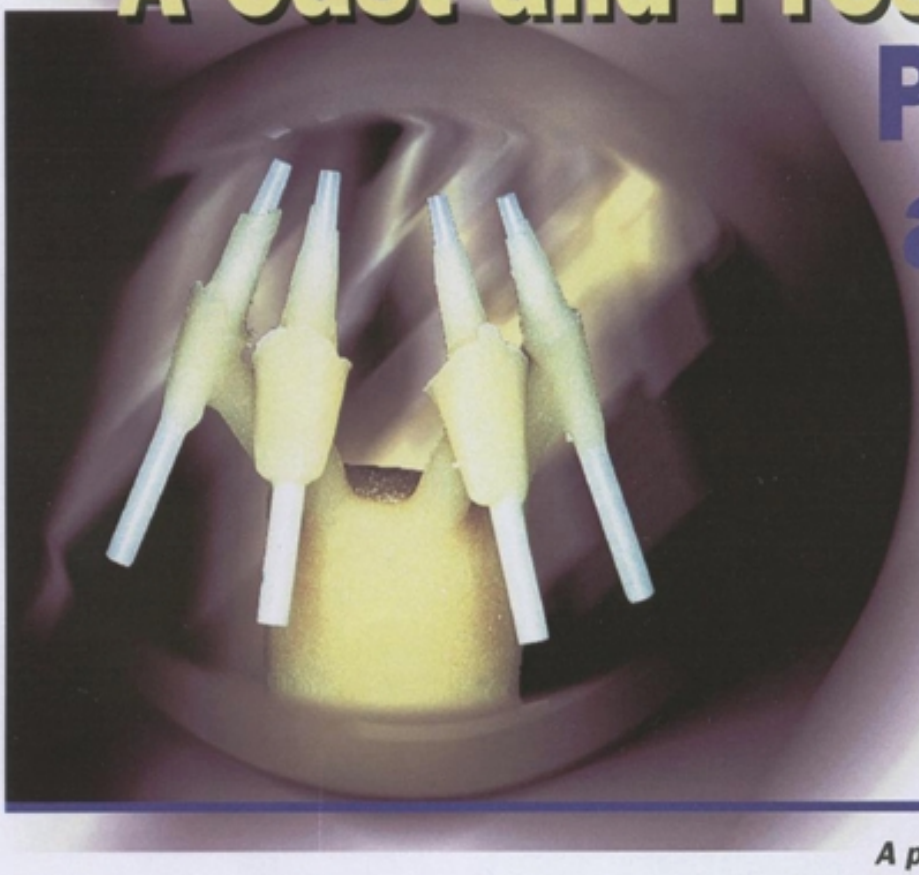
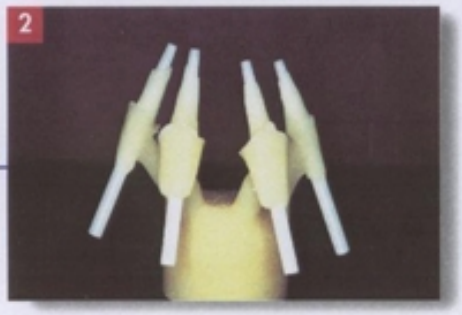
A Cast and Pressed Post and Core



A post and core technique that combines the esthetic advantages of an all-ceramic core with the increased strength of a metal post.

Increased research in the domain of esthetics has urged dental manufacturers to further develop new technologies and systems aimed at facilitating improved dental laboratory applications. A new concept of restoration was created: the All-Ceramic System, an unimaginable system until a few years ago. Prior to this, restorations were limited by a number of problems such as: investments to be used, high fusion temperatures for core materials, the cooling of the core, different thermal expansion coefficients, etc. Now all these problems have been resolved and even complex cases can be treated with ease and confidence.

Fig. 1: Case Study: Complete replacement of 21.
Fig. 2: Pressed CosmoPosts.



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CASE STUDY

A difficult esthetic problem was presented to the dental practice: due to a trauma sustained at a young age, the upper left central was devitalized resulting in the darkening of the tooth over the years (fig. 1). During root canal therapy the dental surgeon decided on an artificial abutment due to the tooth's fragility. Taking into account that an all-ceramic crown will be built up, for esthetic reasons, metal-free root canal posts in zirconium are routinely used (CosmoPost, Ivoclar-Vivadent) with a pressed porcelain core suitable to this purpose (IPS Empress Cosmo Ingot, Ivoclar-Vivadent, fig. 2). However, experience gained over the years have proven that such a solution is not always feasible.

The Solution

For this reason a different technique was sought. A traditional metal post was prepared, with the exception that the portion protruding from the gums

USING ZIRCONIUM OXIDE ROOT CANAL POSTS SUCCESSFULLY

Since the CosmoPost is a ceramic post system, its main application is in the anterior region, where esthetics are most important. CosmoPosts have a 95% success rate in the UK, however, upon inspection, the main reason for failure was found to be due to poor handling either by the technician or by the clinician.

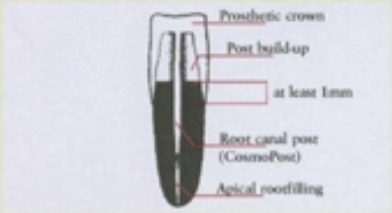
It must be remembered that CosmoPosts are not suitable for all post and core applications.

- The indications and working parameters must be observed at all times.
- The post must neither be adjusted by grinding, shortening, or providing retention grooves, since such measures may result in pre-determining breaking points in the post. Adjustment of the post weakens its strength by one third.
- The post must not be blasted with aluminium oxide. The surface has already been roughened.
- The posts are available in two sizes: 1.4mm for use in the maxillary for lateral incisors and mandibular central and lateral incisors only. The 1.7mm post is for use on teeth which the diameter of the coronal part of the root endodontium clinically indicates a 1.7mm root canal post. These teeth are mainly the four canines, and the maxillary central incisors.
- To avoid fractured posts, loosened post build-ups and root fractures, the preparation margin must be at least 1mm below the build-up in the residual dentine (diags. A & B).
- As these are integral post and core restorations, the impression technique is crucial where the post must not come in contact with the impression tray.

If the defined preparation (residual dentine) is not possible or one of the above requirements can not be met, a metal post must be used, since the risk of post fracture is clearly increased. A fractured post most often results in an extraction of the root as the post is virtually impossible to remove.

* Information kindly provided by Paul Willmer, BD, Professional Services Manager and Maja Mrdovic, BSc (Hons.) Dip. Dental Technology, Technical Coordinator at Ivoclar-Vivadent.

Diag. A: If the residual dentine is insufficient...



Diag. B: The residual dentine must be at least 1mm. In other words, the preparation margin must be 1mm below the build-up.

Fig. 3: Unique post design provides retention for the ceramic core, without obstruction, light easily passes through the crown.

Fig. 4: Waxed core, buccal view.

Fig. 5: Palatal view.

was given a different shape. Two small tapered rods were waxed up (fig. 3) to provide enough support for the ceramic which will form the core, giving the final shape of the abutment (figs. 4 & 5).

The major advantages of this framework are, an improved fracture resistance of the post and an excellent esthetic result, as the position of the two small tapered rods will not obstruct the passage of light.

A high gold, precious alloy was chosen for it's compatability with low fusing porcelain, which we are going to use for this build-up.

A custom abutment is created on the metal framework for which two techniques exist:

Technique 1

Opaque the framework as usual. Build up the abutment out of margin porcelain which is used due to its ideal level of opacity and its ability to block out the opaqued framework. This technique requires at least two firings as the porcelain will shrink.

Technique 2

Press a pressable ceramic (here, Cerpress SL, Leach & Dillon) to the opaqued metal framework. This is done by waxing the custom abutment in the exact dimension desired to the opaqued framework (pressable ceramics do not shrink when processed). Ideally, a high opacity ingot should be used due to its capacity to block out the opaque metal framework (HO0 - HO4 Cerpress SL).

This is the prefered technique as the pressed ceramic core will not shrink during subsequent firings. As explained below, the porcelain will bond to the opaqued alloy post the same way normal veneering porcelain would.

THE PRESSED CERAMIC TECHNIQUE

The special post is waxed up and cast in a high gold content alloy. Oxodise the metal post and apply opaque to the protruding surfaces (area of the post visible when seated in the canal). Ensure the post is correctly located and fully seated on the model exactly. As when making any post and core, the positioning of the post is crucial. Wax over the post and build up the restoration to full anatomic contour. Next, prepare two little silicone indicies for lingual and vestibular surfaces.

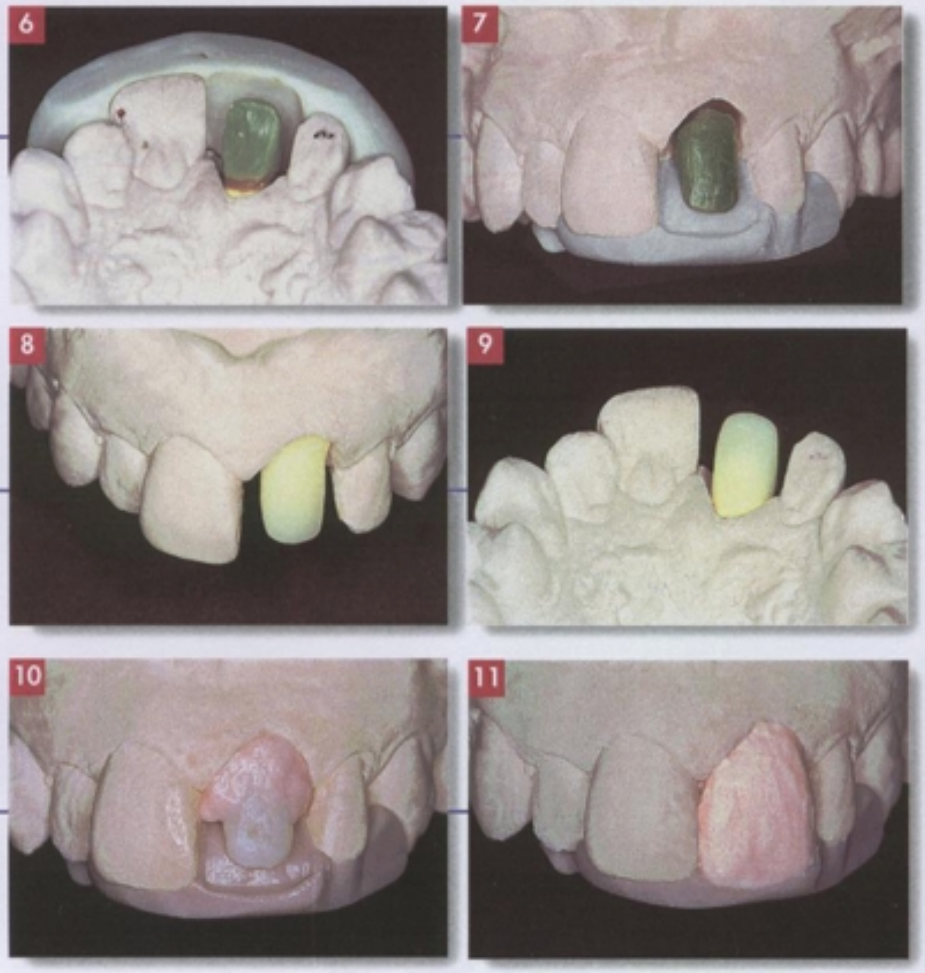
Using the silicon indicies as a guide, cut back the wax pattern in order to

SENSATION SL

The composition of this porcelain powder (reinforced leucite fused in a glass matrix) differs only slightly from that of the Cerpress SL (reinforced fused leucite), giving them the same CTE (between 14.6 - 14.8) at 600 °C. This makes them compatable for bonding with: a) each other, and b) with certain alloys with a CTE between 16 - 16.8 at 600°C. The alloy used here (Sensation 55) has a CTE of 16.6 at 600°C.

Veneering porcelain is applied in powder form, then once placed in the furnace it goes through a drying stage, then glass transition, at which point it is neither a solid nor liquid. Pressable ceramic ingots have virtually the same composition as veneering powders. The drying stage has already passed through so few extra chemicals are added in order to make it useable in this advanced form. The ingot is pressed at the glass transition stage and will bond to the opaqued metal post the same way veneering porcelain does.

Fig. 6: Silicon indicy for the buccal aspect.
Fig. 7: Silicon indicy for the palatal aspect.
Fig. 8: Pressed ceramic coping is fitted to the post and core.
Fig. 9: Palatal aspect: Note perfect fit of the coping is essential.
Fig. 10: Opacious dentine wash.
Fig. 11: Full contour dentine build-up (with indicy in place as a guide for size and contour).



allow room for the pressed coping and layering porcelain (figs. 6 & 7). This forms the core to be pressed with a pressable ceramic. It is important to check that the minimum thickness of the core is not less than 0.8mm and that room has been allowed for the layering ceramic and coping which does not exceed 2.4mm.

Investing and Pressing

Next sprue using a 6 gauge sprue 4-6mm in length and press according to the manufacturer's instructions. Core casting is an easy phase. Investing in a plastic ring provides a superior hardness of investment compared to the traditional paper rings as it prevents the investment from overexpanding, increasing its green strength (strength prior to heating in the furnace). Depending on the setting rate of the investment material used, once bench set (for time required, refer to the manufacturer's instructions) it can be removed from the plastic ring easily.

Using a plastic ring also means that there is no seam on the inside of the ring where the investment is poured. Some think the seam provides a starting point for the investment to crack along, however manufacturers of the paper ring system argue that investment will only crack if there is some other problem (for example, incorrect water/powder ratio). In this case, the investment will crack anyway, seam or no seam. They claim to have had a 10 year success rate with their paper ring system, and therefore, have never had a reason to change it.

The core plays an important role in creating an esthetic crown as the proper shade selection allows us to achieve an esthetic result. Cerpress SL provides pellets in different shades and levels of translucency. Most importantly, all pellets are fluorescent.

Once the core is pressed to the post, it is fitted down onto the model and a coping is waxed over the top of the core. The coping is pressed and finished as normal.

Build Up of the Core

After devesting, the coping is fitted to the post and core (fig. 8). The fit must

Fig. 12: Dentine is cut back.
Fig. 13: Application of incisal porcelain.
Fig. 14: Effect powders and translucencies are applied to complete the build-up.
Fig. 15: Orange effect powder is added to enhance the palatal aspect.
Fig. 16: Fired and fitted to the model.
Fig. 17: Palatal view.

be perfect and after the usual finishing it is ready for porcelain application (fig. 9). There is no need to sandblast the restoration with aluminium oxide or apply thin layers of ceramic before firing the porcelain, as is the case with other all-ceramic systems, as the two materials are so similar in composition that they bond readily.

Provided there is room available, to help increase the value of the shade and further block out the opaqued post, start by applying a very thin layer of opaque dentine on the core (fig. 10). It is not the usual procedure but is adopted in this case where there is no natural abutment.

Apply a contrast amount of porcelain at the tooth neck and then complete the build-up with the aid of the palatal silicone mask (fig. 11). Dentine is cut for the enamel application according to the patient's individual shade and characterisations (fig. 12). I build up an incisal "flat surface" where I apply the incisal effects to be coated with different enamels (fig. 13) giving the final shape (fig. 14). Apply the opaque dentine reinforced with an orange intensifier on the palatal surface and then complete with the colored and opal enamels (fig. 15).

The Porcelain

This porcelain requires no condensing due to its ultrafine particle size (space between the particles is 2-4 microns). In fact, for the build-up, the wetter the better (for increased vitality and less shrinkage). By controlling a proper moisture level of porcelain during build up (occasional blotting with a tissue is acceptable), the shrinkage is minimised and the shape and sculptability is controlled.

The firing temperature is 760°C (1400°F). If necessary, the restoration can be fired again. This porcelain keeps its shade and maintains good bond strength even after 5 or 6 firings, but after the 6th firing the CTE starts to change, increasing the risk of cracking (figs. 16 & 17).

Fig. 18: Metal/ceramic post and core is cemented in place.

Fig. 19: The all-ceramic crown is cemented over the top.

No glaze powder is needed with this porcelain as it will naturally glaze perfectly...

About the author

Born in Ancona, Italy in 1956, Alberto Santini received his Diploma in Dental Technology from the I.P.S.I.A. Benelli (a professional institute) in Pesaro, Italy in 1975. He began working as a dental technician in 1977 and since 1984 has been managing his own laboratory. He attends numerous courses given by the most experienced ceramists from Italy and abroad. He specializes in PFMs and implantology and has committed much time to the development of new generation porcelain materials.

Glazing and Finishing

I personally like to mechanically polish with wheels and brushes prior to a glaze firing in order to check the texture of the tooth. First, I use diamond wheels to create a superficial surface texture followed by silicone rubber wheels to vary the surfaces with areas of high and low shine.

I then fire the restoration for glazing and if necessary, apply some stains. No glaze powder is needed with this porcelain as it will naturally glaze perfectly, but it is up to the technician's personal preference. However, if the Cerpress SL material has for some reason become exposed, a glaze powder will be needed in this area to create a proper shine.

The stains I use are not traditional metal-based stains, but selected rare earths with extraordinary fluorescent properties. They can also be applied internally during the build-up.

Eventually, the crown is cemented and thanks to a perfect camouflage with the other natural teeth, the patient is greatly satisfied with the outstanding esthetic result (figs. 18 & 19).

CONCLUSION

Knowledge and the use of good materials combined with a fruitful cooperation with the dental surgeon enable us to achieve highly esthetic results and a very satisfied patient.◆

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