full arch with the temporary crown in place. The provisional was then re-
moved from the mouth and screwed on to an implant replica fixed to a
stable support with wax. The second crown, designed in 3D, was placed
on the tooth and the temporary crown was removed. Then the tooth was
recovered with a temporary crown. After the preparations, the pro-
visional was removed.

Cad/Cam
Digitally controlled milling machines allow for high-quality work which
is made by using 3D images. The milling machine is equipped with a
self-cure mechanism that allows for milling of tooth crowns and can be
furnished with dental systems that are equipped with a ceramic milling
system. The milling machine is equipped with a self-cure mechanism that
allows for milling of tooth crowns and can be furnished with dental sys-
tems that are equipped with a ceramic milling system.

Definitive crown
The crown was then placed and screw-retained. A new crown for the
restored tooth was fabricated using the same method. A new crown was
then placed on the restored tooth and screw-retained. The new crown
was then placed and screw-retained. A new crown was then placed
and screw-retained. The new crown was then placed and screw-
retained. A new crown was then placed and screw-retained.

Conclusion
Innovative technologies enable extremely accurate diagnosis and treat-
ment planning. Affordable high-quality CBCT has profoundly
changed our profession. In the cur-
rent case, the detailed X-Mind trai-
n3 images allowed for planning and
performing implant placement in the
optimal mesiodistal position.
Correct distances to the lateral inci-
sor and the nasopalatine duct were
obtained. Final choices will always re-
main related to the experience, skills
and equipment of the performing
team. After collecting all of the neces-
sary information and knowing what
technology can provide, it is possible
that one team will opt for CBCT and mono-
lithic crowns, whereas another team
might try to minimise the invasive-
ness of surgery and employ innova-
tive milling strategies to deliver a
predictable, beautiful solution. In
the actual challenging buccopalatal di-
mension, the implant was perfectly
planned and guided into to the cen-
tre of the native bone. Guided bone
regeneration was limited to the min-
imum and minor buccal exposure of
the implant was predicted. Review-
ing the case described above, the fact
that bone volume could be matched
with the dental definitive situation
and the CAD virtual wax-up
made the whole procedure, from
evacuation to final restoration, high-
ly predictable. Bone volume, bone
quality, extent of GBR indicated and
the type of prosthodontic solution
were all known before starting treat-
ment thanks to the implant plan-
ning with the AIS 3D App software.
Both the clinician and patient were
well informed and prepared, avoid-
ning surprises, improvisations and
unnecessary steps. New develop-
ments like smart, scannable healing
abutments will help to continue cre-
at ing treatment outcome and com-
fort improvements.

New materials for a classic indication
Cementation of all-ceramic restorations using Variolink Esthetic

By Drs Eduardo Mahn & Juan Pablo Sánchez, Chile

Zinc-phosphate cements are seen as classic luting materials for the ce-
mented restoration of metal-ceramic crowns. Along with all-ceramic materials,
glass-ionomer cements (GICs) and resin-modified glass-ionomer ce-
ments (RGMICs) were introduced. Generally, luting cements are ex-
pected to meet certain require-
ments: they should provide an op-
jective bond to the tooth structure
and restorative material, must not
be soluble in water, should be suit-
able for application in thin coatings
and should offer long-term stabil-
ity. Thus is in contrast to the proper-
ties of classic cements, which are
water soluble and do not estab-
lisish an adhesive bond to the exor-
dent or dentine (zinc phosphate cements)
or establish only a minimally adhesive
bond and only to the dentine (GICs
and RGMICs). Nonetheless, these
cements show reasonable survival
rates if used for the appropriate in-
dication even if they have certain
limitations.

Problem 1: Opacity
The opacity of the luting material is a critical issue for all-ceramic crowns,
as well as ceramic inlays and onlays. Almost any colour can theoretically
be reproduced with ceramics by ex-
ploting their natural translucent
properties. Using an opaque luting
material appears to be counter-pro-
ductive in achieving this. Further
clinical issues are the limitations
involved in the anterior region and
the location of the cement line in the
visible area for inlays and onlays for
instance, if a tooth is restored with a
veneer, the basic shade of the tooth
is maintained, only the enamel is
replaced, usually by using a translu-
cent ceramic that covers the natural
dentine. In such a case, it is essential
to use a translucent luting material
to achieve a natural result.

Problem 2: Adhesion
The comparatively low bond strength of conventional cements is also
problematic. Classic prepara-
tions around the tooth create a high
degree of friction and retention.
However, the retention is signifi-
cantly reduced with partial crowns,
veneers or onlays. It is therefore ad-
visable to use a luting material that is
capable of providing a strong adhe-
sive bond. Both problems led to the
widespread use of luting composite
materials. Perhaps their only disad-
antage is the removal of excess ma-
terial. These luting materials are hard
and solid and not water soluble; and
they have a high adhesive strength,
making removal of excess diffi-
cult. Early luting composites were
equipped with a self-cure mecha-
nism. Users had to wait a few min-
utes until the composite was almost
fully set before they could remove
the excess material. This period was
risky because of the moisture in the
mouth. Blood or saliva could come
into contact with the non-polymer-
sised composite and cause damage.

Editorial note: A list of references is available from the author.
ZirCAD MT Multi
The most esthetic high-strength, multi-translucent\textsuperscript{1} zirconia

\textsuperscript{1} Composed of different material classes
Dual-curing luting composites

These issues led to the rise of dual-curing composites for the cementation of all-ceramic crowns. Dual-curing luting composites are usually delivered in double-push syringes with a mixing tip. During extrusion, the base and catalyst are automatically mixed. The material can be applied directly. The main advantage is that the curing process can be accelerated with light and excess material can easily be removed. At the same time, the self-cure mechanism ensures a reliable cure, even with relatively thick or opaque ceramic layers. Nonetheless, there are some situations in which excess material cannot be removed at all easily because the setting reaction takes place too quickly or the material does not cure down to the depth of the composite layer. After one second of light curing, the surface is set and excess can be broken off, but the material is still paste-like at the interface to the crown or tooth. Excess can be polymerised en bloc and pulled off as a ring in one go with no uncured material left in contact with the tooth or crown. In addition, the luting composite does not contain amine, which is another advantage, since amine may be implicated in discoloration of the cement line over time.

One material, five shades

Variolink Esthetic (Ivoclar Vivadent) is based on the value shade concept. The cementation methods used in conjunction with all-ceramic materials have changed for single-crown restorations. Variolink Esthetic is a luting composite that offers highly aesthetic properties, make this material an asset in day-to-day dental restorative care.

Clinical case

A 45-year-old male patient presented to the practice with a restoration on tooth #46. The tooth had been endodontically treated and temporised with a filling (Fig. 1). The temporary crown was removed beforehand (quarter section) and the tooth built up with a filling (Fig. 2). The temporary crown was then seated (Fig. 3a & b). The adhesive (Tetric N-Bond Universal) was applied and dried. The isolated enamel was then etched (Fig. 4). After the crystallisation firing, the crown was staining and glazed (Fig. 4). The next step was to etch and silanate the ceramic crown with the new glass-ceramic primer Monobond Etch & Prime (Ivoclar Vivadent). This primer combines a ceramic etching and silanating component in a single material and therefore eliminates the need for the ceramic to undergo hydrofluoric acid etching (Fig. 5). After the etching and silanating step, the crown was reseated with water and dried. The isolated enamel was then etched (Fig. 6). The adhesive (Tetric N-Bond Universal) was applied and dispersed with a strong stream of air. The dual-curing version of the Variolink Esthetic luting composite was used for seating owing to the thickness of the crown and the low transparency of the ceramic material (Fig. 7). The luting composite was applied into the crown. The restoration was then seated (Fig. 8) and light-cured from each side for two seconds. Excess composite was easy to remove owing to the Ivocerin photoinitiator (Ivoclar Vivadent), which provides a fast and thorough cure with a minimum amount of energy (Fig. 9). For final polymerisation, the restoration was light-cured from each quarter for 20 seconds (Fig. 10). Figures 11 and 12a & b show the oral situation after placement of the crown. Although the cement line was located above the gingival margin, it was not visible owing to the favourable tone and opacity of the luting composite. Figures 13a & b show radiographic control images before and after the treatment.

Conclusion

The cementation methods used in conjunction with all-ceramic materials have changed for single-crown restorations. Variolink Esthetic is a protagonist of the latest generation of luting composites. Excellent bond strength values, coupled with user-friendly handling characteristics and highly aesthetic properties, make this material an asset in day-to-day dental restorative care.