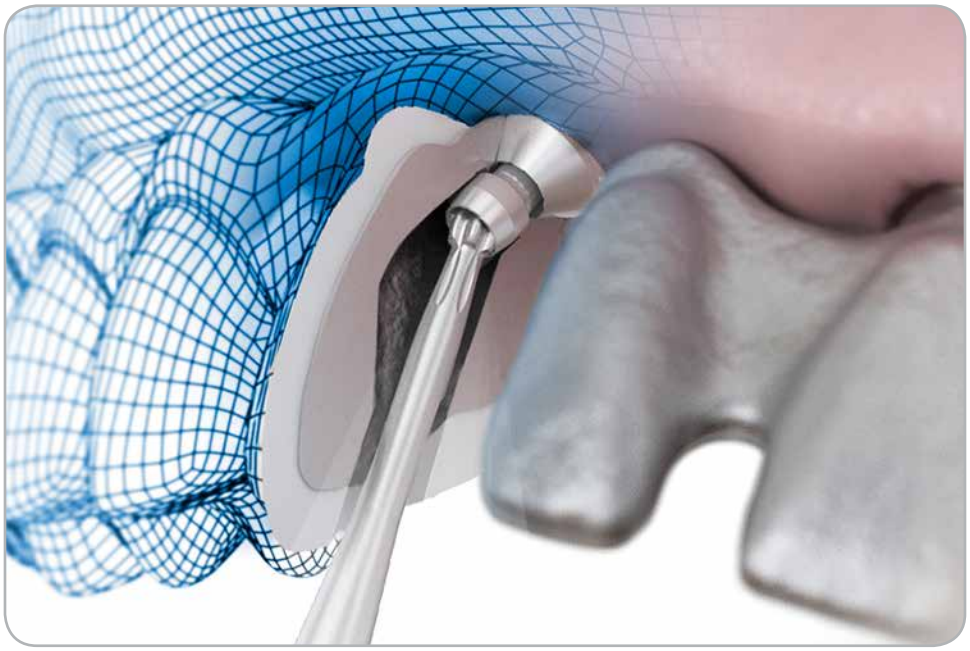
ABSOLUTE DENTAL SERVICES

Established 1994

A CLINICIAN'S GUIDE TO IMPLANT RESTORATIONS

by Conrad J Rensburg, Absolute Dental Lab



SCREW-RETAINED
THE FUTURE OF DENTAL IMPLANTS

ABSOLUTE DIGITAL DENTISTRY

ABSOLUTE DIGITAL CASE PLANNING

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Fixed Hybrid Set-up

Implant Retained and Supported Restorative Solutions for the 21st Century

This product and protocol manual describes some of the more popular restorative options and technologies available on the market today. These innovative products are not implant brand specific and are opening a new world of restorative options for our patients.

A few years ago, the FDA classified implant based restorative products as medical devices. All US milling facilities (including laboratories) creating any custom components had to apply for FDA approval. Because of this, all facilities are regularly inspected and required to maintain 510k FDA accuracy tolerances in all their products. This effectively standardized the quality of products created by all milling facilities inside the USA. This regulation guarantees our patients only receive high quality, FDA regulated products, no matter which milling facility is processing the component.

The restorative products and protocols discussed here are available on most popular implant systems. CAD technology and in-house milling is now allowing dental laboratories the ability to create custom prosthetics previously not possible.

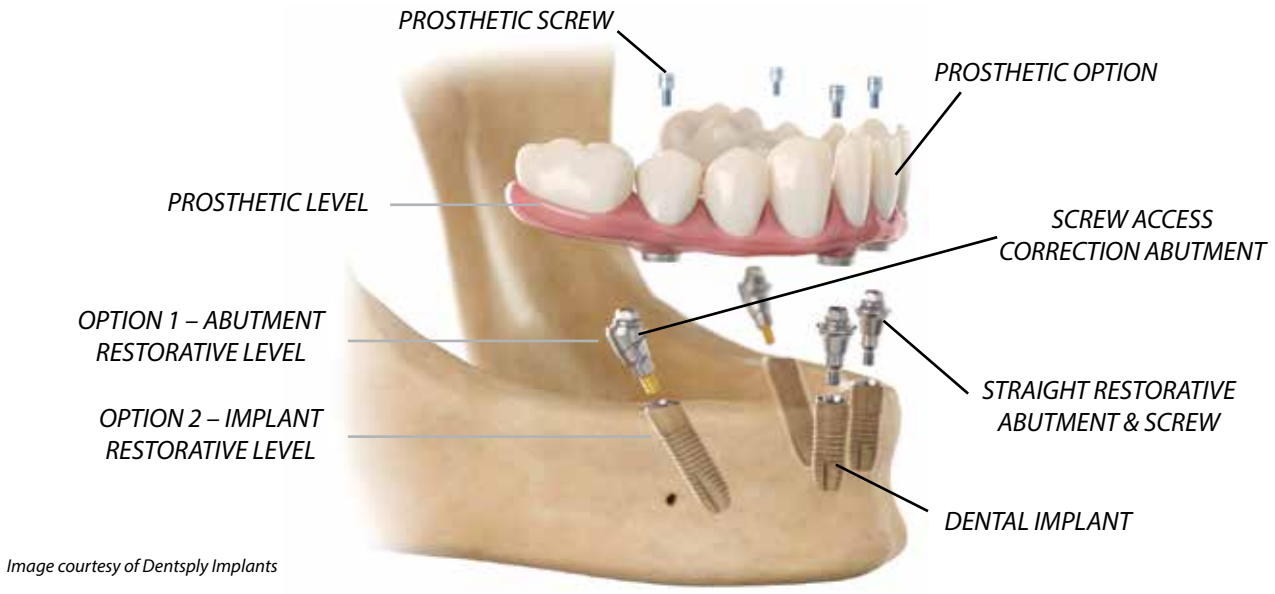


Image courtesy of Dentsply Implants

Hybrid and Screw-retained Restorative Options

Advances in technology and innovative products are allowing our restorative teams the ability to use a screw retained option in almost every application. Having the ability to restore 100% of our implant patients with a retrievable yet highly esthetic restorative option has finally become a reality.

Restorative Options and Technologies in this Manual

- Clinical and restorative steps
- Wrapped acrylic over titanium suprastructure
- Layered or monolithic and combination zirconia
- Zirconia / titanium hybrid
- Layered ceramics over CoCr suprastructure
- ACB screw-retained solution – screw-mentable crown
- Angulated Screw Access technology (ASA)
- LOCATOR F-Tx fixed hybrid

Restorative Protocol

(Full arch or partial, screw-retained prosthetics)

The following is a suggested restorative case-flow protocol. Although every case is unique, this represents a standardized appointment schedule, to restore a screw-retained hybrid.

FIRST APPOINTMENT

Clinical

- Take an implant-level or abutment-level PVS impression (Preferably use an open tray impression technique).
- Splint impression copings with acrylic bridge to stabilize.

Lab

- Pour a soft tissue model and fabricate a bite rim and verification jig.

SECOND APPOINTMENT

Clinical

- Verify model accuracy by placing verification jig into implants or at abutment-level. Verify with hand pressure. Note: no need to screw down.
- Register a bite as if fabricating a denture or partial. Request shade and mold.

Lab

- Set up a wax based tooth try-in for patient approval and bite check.

THIRD APPOINTMENT

Clinical

- Tooth try-in and bite verification. Patient approval on final esthetics shade and tooth position.
- Choose restorative option based on patient-specific needs.

Lab

- Fabricate a supporting sub-structure within bucco-lingual parameters set by tooth try-in
- OPTIONAL - Frame try-in without teeth, or
- ACRYLIC OVER TITANIUM - Teeth will be added to sub-structure for final try-in, or
- LAYERED CoCr / ZIRCONIA – Restoration will be processed for final delivery.

FOURTH APPOINTMENT

- Final delivery of CoCr or Zirconia restoration.
- Final try-in for wrapped acrylic over titanium bar.

FIFTH APPOINTMENT (Titanium only)

- Final delivery of wrapped acrylic over titanium bar.

Absolute Dental Lab
Lab layered ceramics over CoCr

Hybrid Options, Considerations & Requirements

Product	Manufacturer & Requirements	Application	Design Options	Screw Access	Function
Wrapped Acrylic over Titanium	Multiple products: Atlantis, Procera, Panthera etc. Minimum requirements from tissue to opposing; • 12mm minimal vertical • 3 x 3mm for suprastructure connections Maximum vertical milling height 22mm	Full arch & Partial arch	Acrylic or porcelain teeth over titanium bar	Control with Atlantis ASA & Panthera ASC	Fixed hybrid application
Monolithic Zirconia	Multiple products: Procera, Panthera In-house etc. Minimum requirements from tissue to opposing; • 10mm - Monolithic tissue to opposing occlusion • 12mm - Layered Maximum vertical milling height 20 - 22mm	Full arch & Partial arch	Monolithic occlusion optional layered anterior	Control with Panthera ASC & Dess ti-base Aurum Angulated Screw Channel	Fixed hybrid application
Cobalt Chrome Layered	Multiple products: Atlantis & Panthera etc. Minimum requirements from tissue to opposing; • 3mm vertical with metal occlusion • 5mm vertical with layered ceramics • 3 x 3mm for suprastructure connections Maximum vertical milling height 22mm	Full arch & Partial arch minimum 2 splinted units	Layered ceramics metal occlusal/ lingual optional	Control with Atlantis ASA Panthera ASC	Fixed application
Zirconia Titanium Combination	In-house & Cagenix etc. Minimum requirements from tissue to opposing; • 8mm vertical No vertical height restrictions	Full arch & Partial arch	Monolithic occlusion optional layered anterior	Control with Atlantis ASA	Fixed application
Titanium Clip Bar w/ Denture	Multiple products: Atlantis, Procera, etc. Requirements from tissue to opposing; • LOCATOR Bar 12-15mm • Hader 10-12mm • Dolder 8-10mm No vertical height restrictions	Full arch with or without vestibule	Option for patient requiring a vestibule to restore bone deficiencies	Two piece design. No need for access control	Removable option with fixed function
Conus Denture	Only Atlantis Available for most major implant systems Requirements from tissue to opposing; • 15mm suggested around implants - Less required in edentulous areas No vertical height restrictions	Full or Partial arch with or without vestibule	Great option for patient not a candidate for fixed hybrid or existing LOCATOR	Custom Conus abutments correct to 30 degrees angulation	Feel of real teeth with removable feature for hygiene
LOCATOR & LOCATOR F-Tx	Zest Anchors, available on most systems Requirements from tissue to opposing; • LOCATOR denture 8mm • LOCATOR F-Tx denture 10mm No vertical height restrictions	Full arch F-Tx designed for off-angled implant cases	F-Tx ball and socket connection Correct for angulation and upright	Not applicable	LOCATOR F-Tx clip retention steel on steel connection LOCATOR snap retention

Acrylic Wrapped Over Titanium Frame

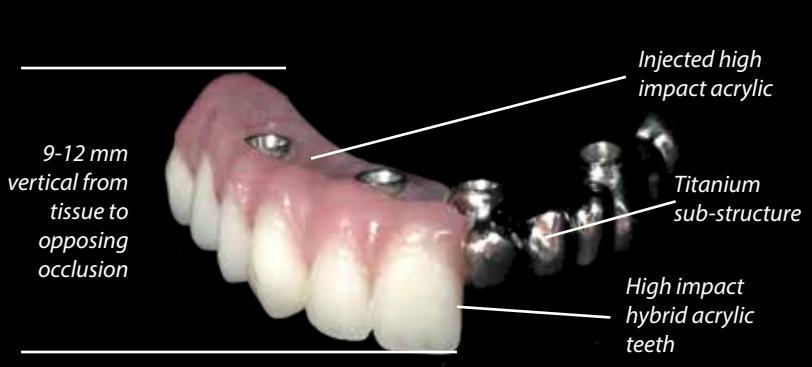
This is the original hybrid and probably the most popular one on the market today. It is one of the more economical options and arguably the most used protocol for full arch restorations. Although very popular, it does come with some long-term drawbacks. Because it is supported by a titanium frame, there is no chemical bond between the acrylic and alloy. This is a cause of separation between the materials under function and ultimately prosthetic failure. Another cause of failure is simple acrylic fatigue. Even high strength injectable acrylics are designed for tissue-supported, cushioned, occlusion. In the case of a hybrid, the occlusal forces are bone-on-bone exaggerated, creating additional stress.

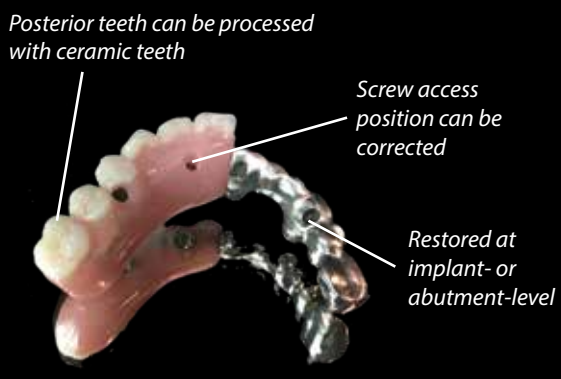
Cuspid-rise or steep protrusive interference overstresses these hybrids. Special emphasis should be placed to set up with an open bite anterior and flat plane occlusion to prevent a "locked in" occlusion scheme. Over time, we see the posterior teeth wear and therefore the bite closes, locking the patient's occlusion and creating failure. Some clinicians like to process the posterior with ceramic teeth to counteract this wear process.

In other cases, the acrylic teeth and acrylic base is simply not strong enough to hold up to certain patients' occlusal forces. Special attention should be paid to patients with bruxing or clinching habits as these will be exaggerated once they lose proprioception. Although not for every application, it is easily repairable and resetting with a new set of teeth is an economical upgrade.

ACRYLIC WRAPPED OVER TITANIUM

Application	Full or partial arch.
Vertical requirements	9-12mm minimal – Cantilever extension 1.5 times AP spread.
Advantages	Most economical option, easily repairable, good esthetics.
Disadvantages	Acrylic known to fracture, prone to stain, discolor & wear; 3 to 5 year life span on teeth & acrylic. Not a good option for high stress occlusion.
Screw access	Can be controlled by using Atlantis ASA option. Restored from implant- or abutment-level platform. Available on most major implant systems.
Warranty	10-year Atlantis warranty* on sub-structure. (Absolute offers a 3-year warranty on teeth and acrylic.)
Average price range	$3500 to $4800 depending on number of implants and sub-structure type.





Monolithic Zirconia

Over the last few years, in search of a stronger hybrid solution, this type of restoration has gained huge popularity amongst clinicians. Because of the inherent weakness and subsequent failures of acrylic hybrids, this option is prescribed regularly for the strength its monolithic design offers.

Its superior functional strength is also responsible for its greatest weakness; bright esthetics in low value shades. If processed in high value and bleach shades, the material performs well. However due to its inherent reflective nature, it becomes challenging for even the best technicians to create a lifelike low value shade.

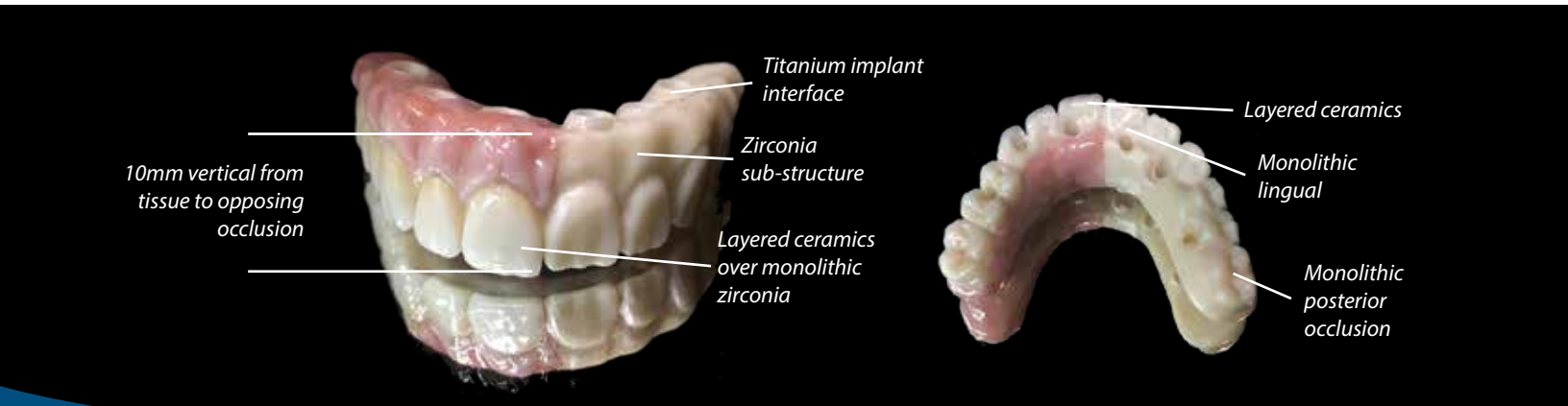
The material can be processed in a full monolithic or a combination layered/monolithic setup. In most combination cases, the posterior teeth and lingual functional areas will be processed in monolithic zirconia while the non-functional areas, on the anterior, will be layered for esthetics.

The popularity of this material is further driven by the simplicity in fabrication through digital design and milling. This digital design process requires less skilled labor. This low labor input offers a huge advantage for labs who are struggling to find skilled technicians. Where this was once a large source of income for outsourcing and milling facilities, most labs currently have the designing and milling abilities to process these cases in-house. Furthermore, these cases are designed in digital media and archived for re-fabrication if ever needed.

Initially very expensive, zirconia discs, milling units and design software used to process these cases have become a commodity making the processing very cost effective.

MONOLITHIC, LAYERED OR COMBINATION ZIRCONIA

Application	Single units, full as well as partial arch.
Vertical requirements	10mm minimal – Cantilever extension 10mm.
Advantages	Monolithic occlusion for strength with layered ceramic facials for esthetics or full monolithic design. Can be processed as combination case with monolithic zirconia and layering ceramics. Design is digitally archived for modelless remake if needed. Monolithic design reduces the risk of cusp chipping.
Disadvantages	Post-delivery sub-structure failure concerns and bright esthetics. Not a good option for low value shades. Not repairable in case of a fracture.
Screw access	Must be corrected with a correction abutment at implant level – Can be corrected with Panthera ASC.
Warranty	5-year warranty on sub-structure. (Absolute offers a 3-year warranty on layered ceramics.)
Average price range	$4500 - $5500 depending on layering or monolithic choices and number of implants.



Monolithic Zirconia / Titanium Hybrid

Because of sub-structure failure concerns, there are signs of a movement developing away from monolithic zirconia hybrid options. The simplicity offered through digital fabrication and low labor requirements, combined with the fact that there are no other true monolithic hybrid options, maintains this material's popularity in the market.

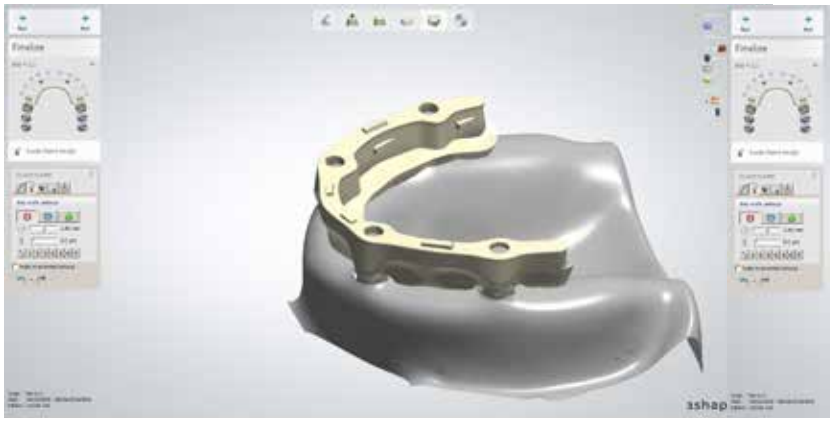
Today, many labs can mill zirconia in-house while most milling facilities have the ability to mill custom designed support structures. Combining an alloy sub-structure, milled from titanium or CoCr, allows the lab to fabricate a true zirconia/titanium combination hybrid. This combination hybrid solves many of the zirconia sub-structure strength concerns and acrylic teeth fracture issues with a wrapped hybrid. This very unique product offers us the strength and superior fit of a milled alloy frame with the monolithic occlusal surfaces of a traditional zirconia hybrid. Furthermore, when using a cementable milled alloy sub-structure, the lab now can offer a more translucent zirconia with better esthetics, without sacrificing strength.

EFFICIENT FAILURE RECOVERY

The manufacturing laboratory will digitally archive the design file. In case of zirconia chipping or failure, the lab can re-mill a new cementable zirconia piece. After removal from the mouth, the zirconia piece can be recemented chairside or in the lab.

PMMA VARIATIONS

When fabricating this type of product with a PMMA material in lieu of zirconia, labs can manufacture an efficient long term "semi" temporary solution. Reprocessing the PMMA piece is extremely inexpensive and can be replaced as often as needed with limited chair time required.



Titanium sub-structure design

Monolithic Zirconia design file for milling

PMMA over Titanium

Monolithic Zirconia over Titanium

Layered Ceramics Over CoCr

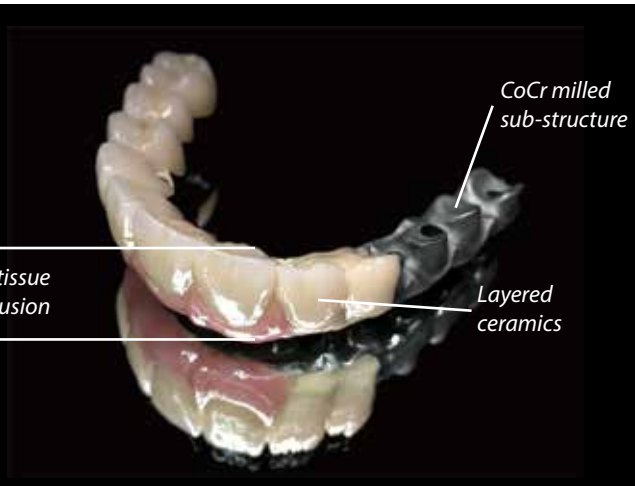
This hybrid option brings the artistry back to full arch hybrid cases. Although a premium and very unique option, it is not very well known amongst clinicians and technicians. The biggest advantage a CoCr hybrid brings is its superior esthetics and extreme framework strength. They can be utilized in almost any case and processed at abutment or implant level. When processed with metal occlusal they can be restored in severely reduced vertical application, this solution is very predictable, even where no other hybrid option will work.

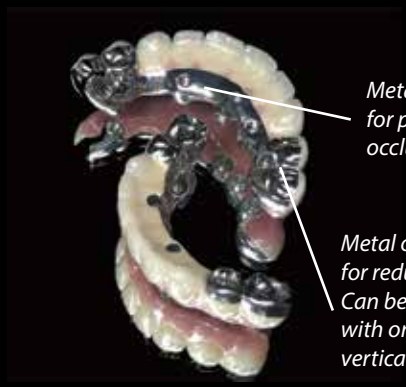
The CoCr utilized for dental application is a type IV alloy and contains no Nickel, making it very versatile to use intra-orally. With a thermal expansion of 14,0 to 14,9 µm/m.K it processes extremely well with almost all dental ceramics on the market today. The alloy make-up consists of 54% Cobalt, 20% Chromium, 16% Tungsten and other trace elements. Because this alloy does not contain any Nickel, it produces an exceptional oxidation layer during degas cycle. Even when processing large frames, where pink tissue is required, the ceramic/CoCr interaction has proven to be extremely predictable. We have processed a multitude of these hybrids and have rarely experienced any processing issues during fabrication.

When processing zygomatic implants where emergence of the posterior implants are sometime palatal to the ridge, CoCr hybrids offer a distinct advantage over acrylic or zirconia. The distal extensions into the palate can be processed much thinner than on any other hybrid, greatly contributing to patient comfort. A CoCr hybrid offers distinct esthetic and strength advantages over all other options currently available on the market. When used in conjunction with ASA technology it can be used predictably in partial as well as full arch application, even where other hybrids would be compromised.

LAYERED CERAMICS OVER CoCr

Application	Full or partial arch.
Vertical requirements	6mm from tissue to opposing, 3-5mm with metal occlusion – Cantilever 1.5 times AP spread.
Advantages	Exceptional esthetics and strength in sub-structure. Screw access can be positioned by using Atlantis ASA option. Great bridge application. Can easily be repaired by lab. Metal occlusion an option. Requires only 3-5mm vertical clearance (tissue to opposing) when used with metal occlusion.
Disadvantages	Case must contain a minimum of 2 implant units in a bridge/splinted application, no single unit application at time of publication. Layered ceramics can be prone to fracture under stress.
Screw access	Full control over screw access position on most implant platforms.
Warranty	5-year manufacturer warranty on sub-structure. (Absolute offers 3-year warranty on ceramics.)
Average price range	Partial application $575 - $600 / implant bridge unit. Full arch hybrid $6500 – $7500.





Titanium Clip-bar With Denture

With the introduction of LOCATOR attachments in the mid-2000's, our industry noticed a huge decline in the amount of clip bars prescribed. This was partly due to the simplicity LOCATOR attachments offered and also because of the unpredictability of casted and soldered clip bars. Although considered an "old school" restorative option, technology now affords us the ability to process these clip bars with great long-term predictability.

The biggest advantages a clip bar offers, over a LOCATOR supported case, is cross arch stabilization of the implants. The clip bar function is implant retained while the LOCATOR is implant supported, meaning the clip bar will offer a more stable occlusal function. Because LOCATORs are clip retained, some implant positions will cause fulcrum point movement under function. Furthermore, these bars are now milled from a block of solid titanium instead of cast alloy, this has eradicated the fear of post-delivery bar failure.

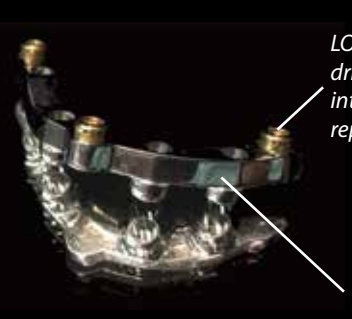
By utilizing the axial walls of the bar to stabilize the prosthesis, we can provide our patients with a removable option that still functions like a fixed hybrid. The use of a clip bar eliminates any possible fulcrum point that is exaggerated when using LOCATOR attachments.

Digital design offers us a multitude of retention options and bar designs like Dolder, Hader, Side-Mount, LOCATOR, Ball etc. The strength of the titanium allows us to fabricate these bars at much thinner tolerances than ever possible with casting. Using a clip bar allows the restorative team to process the denture with or without a vestibule, depending on the individual needs of the patient.

Technology has truly revived this restorative option and although we now have a multitude of restorative options to restore an implant retained case, this is still an option with many valid applications.

TITANIUM CLIP BAR WITH REMOVABLE DENTURE

Application	Full arch.
Options	Titanium with Dolder Clips or LOCATOR attachments.
Vertical requirements	LOCATOR bar 15mm – Dolder bar 8-10mm.
Advantages	Restore with or without vestibule. Removable & hygienic option. Clips can be replaced when worn.
Disadvantages	Large amount of uncomfortable hardware. Bucco-lingual thickness.
Screw access	Implant position and screw access not a concern.
Warranty	10-year Atlantis manufacturer warranty on titanium bar.
Average price range	$2800 – $3400 depending on type of clips. Includes metal support for denture.



Conus Concept Hybrid Denture

Arguably one of the most innovative restorative concepts to become available in many years. The Conus concept is based on the well proven SynCone system but perfected through digital design and milling. The basic make-up of the system is a machined gold alloy, friction fit, retention coping that mates with a 6 degree tapered titanium CAD abutment. The system can be used for partial as well as full arch application and can be processed with or without a vestibule.

There are multiple advantages of restoring a case with the Conus concept. The most valuable is the fact that it is a removable denture that functions with the same feel as a fixed prosthesis. In many cases, the restorative team will determine that a patient is not to be a suitable candidate for fixed hybrid therapy because of hygienic or lip support considerations. The Conus concept offers the restorative team a true fixed, functional but still removable prosthetic alternative.

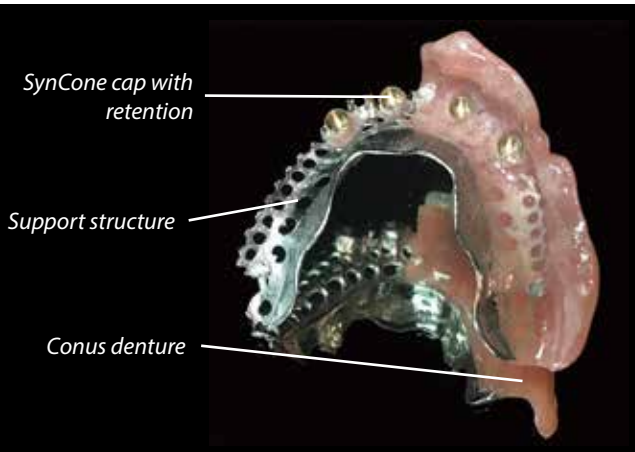
The Conus concept is an exceptional alternative for existing LOCATOR patients who are not happy with the functional feel of clip retention or dealing with denture rocking due to fulcrum points. Although a minimum 15mm occlusal space is needed to process a Conus case, this is only true for areas around the implant sites. Furthermore, the Conus solution does not need a wide implant placement or AP spread to be functionally successful. Most patients have ample bone in the pre-maxilla and this means we can treat more patients with less invasive surgeries.

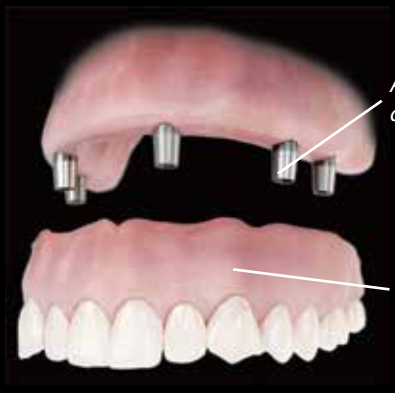
The Conus concept can correct up to 30 degrees for implant angulation and be restored at the implant level, and is available for most major implant systems on the market today.

Visit AbsoluteDentalLab.com for a custom Conus concept protocol manual.

CONUS CONCEPT HYBRID DENTURE

Application	Full or partial arch.
Vertical requirements	15mm minimum above implant sites.
Advantages	Restore with or without vestibule. Removable option with functional feel of a fixed hybrid. Horseshoe open palate design. 15mm vertical only required around implant sites. Can be restored with a shallow AP spread to full occlusion. Friction fit SynCone caps have minimal wear and limited maintenance long term. Available for most major implant systems. Exceptional upgrade for existing LOCATOR patients. Includes a highwater sleep denture. Exceptional partial option where vestibule is needed.
Disadvantages	Strong retention makes prosthesis tough to remove with limited dexterity.
Requirements	Full arch application – 4 implants (Minimum of 4 implants required for full arch). 3 to 4-unit partial application – 2 implants 6 to 7-unit partial application – 3 implants
Average price	$3600 – $3850 depending on components.





Screw-retained With Angulated Screw Access (ASA)

ANGULATED SCREW ACCESS

Application	Correct screw access up to 30 deg. Screw-retained partial bridge to Full arch.
Vertical requirements	As little as 5mm, can use metal occlusal/lingual in reduced vertical cases.
Advantages	No cement cleanup. Economical option. Screw access re-positioning. Retrievability. Posterior or anterior application. Exceptional esthetics. Available for most major implant systems. Abutment or implant level.
Disadvantages	At time of publication only available for two or more implant units in splinted application.
Warranty	10-year Atlantis suprastructure warranty*. (Absolute offers 3-year warranty on ceramics.)
Price range	$550 – $580 per implant unit. Pontics charged at regular PFM rate.

Case pictures courtesy of David Hedgecoe, DDS
Case fabricated by Absolute Dental Lab

Restorative workflow

1. Digital or PVS impression

2. Tooth set-up

3. Diagnostic try-in

4. Digital dual design scan

Angulated Screw Access (ASA)
30 degree correction

5. Lingualized screw access

6. Framework

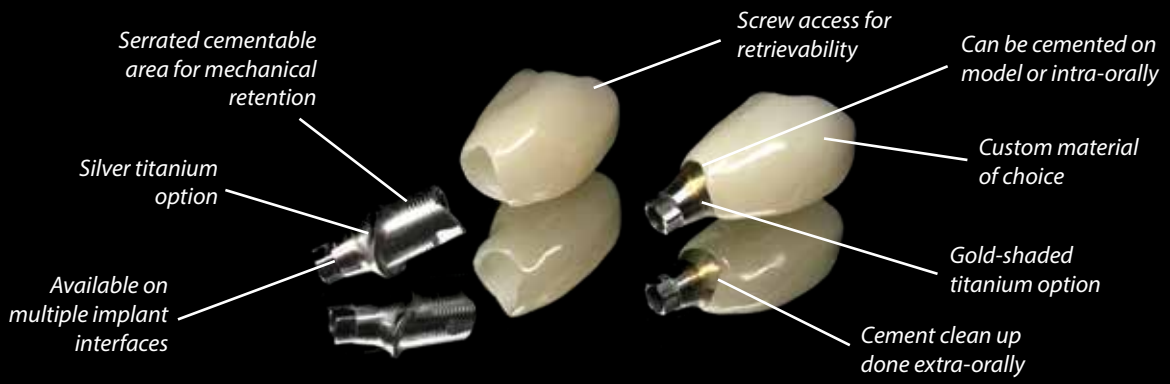
7. Seating verification

8. Pink porcelain for length adjustment

CustomBase (ACB) “Screw-mentable” Crown

CUSTOMBASE SOLUTION

Application	Single unit.
Vertical requirements	5 to 7mm minimal from top of implant to opposing occlusion.
Description	ACB is a custom support interface connection designed to connect a milled ceramic crown to an implant interface. The crown can be cemented extra- or intra-orally to the ACB titanium abutment. Abutments can be fabricated in gold-shaded or silver titanium.
Advantages	Retrievable option with no cement cleanup. The ACB custom support CAD abutment offers more cementable area than a stock ti-base connection for screw-retained crowns and bridges. It offers the ability to use multiple material options – e.max, high strength and high translucent zirconia, monolithic, layered or combination. Can correct screw access up to 30 degrees by combining ACB with ASA technology on some implant platforms.
Disadvantages	Titanium sub-structure can cause metal bleed through, in thin areas, when high translucent zirconia is used.
Material	Titanium and gold-shaded titanium support abutment covered with a milled ceramic material of choice.
Warranty	10-year Atlantis warranty on ACB abutment.(Absolute offers 3-year warranty on ceramics.)
Price range	$550 - $595 per implant unit.



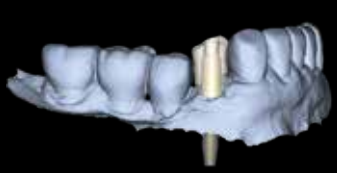
Seating workflow

Digital or PVS impression

Atlantis digital design file

Digital wax-up

Case photos courtesy of Jessica L Bishop DDS; Case fabricated by Absolute Dental Lab



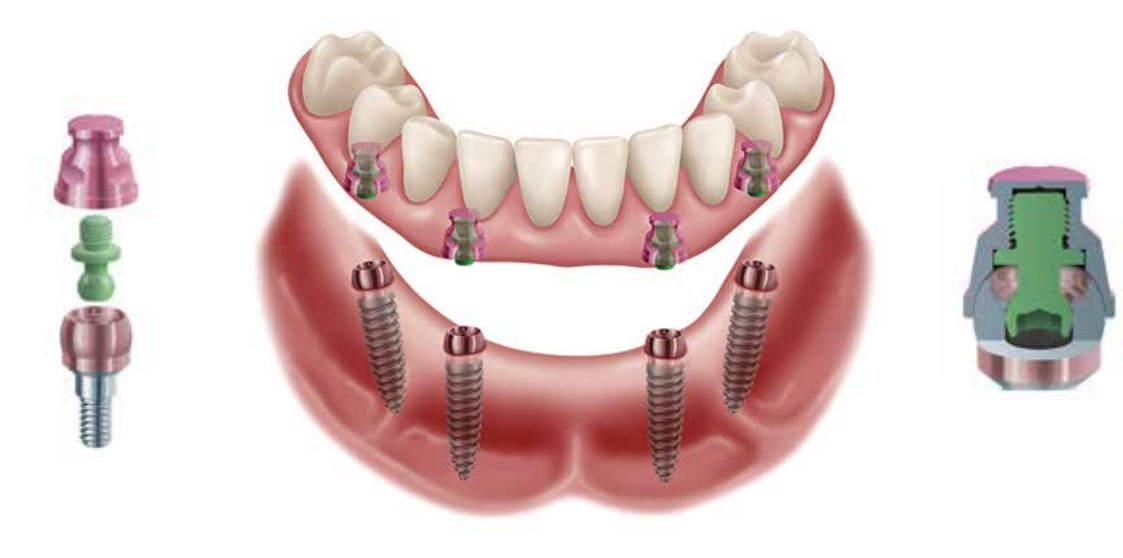
ACB Design and screw access

3Shape crown design and in-house milling

Composite screw access filled at delivery

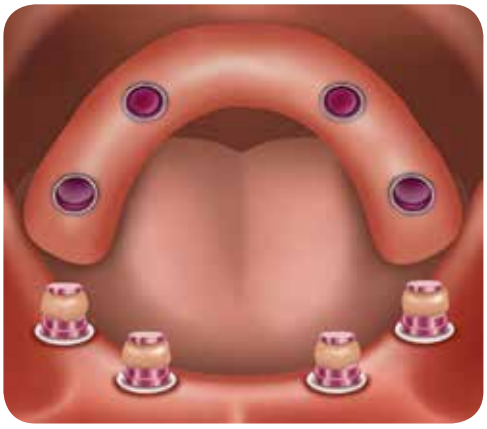
Fixed Full-arch Hybrid With LOCATOR F-Tx

The LOCATOR F-Tx Fixed Attachment System is a denture attachment used to stabilize full-arch cases with a snap-fit retentive component. Unlike traditional fixed restorations, LOCATOR F-Tx "snaps" into place creating a stress-free, passive connection without the need for screws or cement. The System is fixed for the patient but removable by the clinician.



The system offers

- 20-degree angle correction from implant level
- Denture attachment can rotate 360 degrees to compensate for draw
- Fixed full arch hybrid system without the need for screws or access holes
- PEEK Retention ball;
  - » Black – Processing
  - » Blue – Immediate load
  - » Tan – Medium retention
  - » Green – High retention
- Effective with cantilever extensions up to 1X Anterior/Posterior spread



Components needed

- LOCATOR F-Tx abutment and denture retention cap kit
- Pick up acrylic for chairside pick-up of caps – VOCO Quick Up
- Removal tool bar and nylon filament loop for removal
- Dedicated retention ball hex driver

The Artistry of Absolute

CoCr SUPRASTRUCTURE WITH LAYERED CERAMICS

CoCr SUPRASTRUCTURE WITH ASA TECHNOLOGY

CONUS HYBRID DENTURE

Absolute Dental Lab

Established in 1994, Absolute Dental started as a fixed prosthetics lab in the Triangle area of North Carolina. Two decades later, Absolute's restorative focus is much broader but their attention to product detail and exceptional customer service has not changed.

Today, Absolute is a full service dental lab and our team is renowned for their expertise in creating world-class dental esthetics. Their use of cutting edge technology in CAD and milling departments, as well as their extraordinary dental implant and high end removables sections, enables them to deliver lifelike and functional dental prosthetics.

Staying abreast of new technologies, yet only implementing relevant protocols and procedures, has earned Absolute a reputation for being a trusted partner to discerning clinicians throughout the United States.

Serving their customers with Absolute Excellence has always been the primary focus of the owners, branch partners and team members...this remains true today.

Conrad J Rensburg

Conrad J Rensburg graduated under full scholarship with a 4-year Baccalaureate degree from Pretoria Tech in 1992. He is certified with an ND in technology and NHD in fixed prosthetics.

He is the President and co-owner of Absolute Dental Services headquartered in the Research Triangle of North Carolina. He is a member of the prestigious PEERS group and is certified by the SADTC. He has specialized in fixed dental prosthetics with an emphasis on dental implants since the 90's. As a CE-accredited speaker since 2002, he has lectured at more than a thousand events across the USA, including the Academy of Osseointegration, Global and US symposiums and World Summit Tour. His lectures and published articles focus on CAD implant design protocols and fixed as well as removable hybrid implant supported techniques.

ABSOLUTE DENTAL SERVICES

Perfection is Not Optional!

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