Concepts for Successful Implant Therapy

By Edward Feinberg DMD

The Proper Use of Implants

One of the greatest innovations for the advancement of the dental profession is the osseointegrated dental implant. Where appropriate, dental implants can be a godsend and restore form and function to patients who have lost dentition. However, the use of dental implants has mushroomed far beyond their actual capabilities. Dental implants are being overused and used inappropriately, and this practice has resulted in a rising failure rate. "The long-term prognosis for implants has been shown to be far less promising than that for natural teeth, even when they are compromised by periodontal disease or endodontic problems," conclude WV Giannobile and NP Lang.[1] In short, implants should be a last resort, except in certain circumstances (such as congenitally missing lateral incisors among virginal teeth with no periodontal bone loss). However, the placement of dental implants as a first resort has become the norm.

When osseointegrated implants first came to this country in the 1980s, they were used only for fully edentulous arches. Dr. Per-Ingmar Brånemark was a true scientist and he invested 20 years of scientific research before bringing his invention to this country. Following his instructions guaranteed a success rate of at least 85-90%.[2] In the 1990s, practitioners started using implants for single tooth and small bridge restorations. The dam seemed to have burst in the 2000s. Patients--often unknowingly--have become guinea pigs for implant treatments that violate established protocols and basic engineering principles.

Save Teeth *First*

Today teeth are often extracted that Dentistry can EASILY save, such as teeth with little or no clinical crowns. Sadly, most dentists do not know how to save these teeth. WV Giannoble and NP Lang have observed that "often practitioners recommend implants even when teeth are only modestly compromised by caries, the need for endodontic therapy, or periodontal disease to provide the patient with a quick solution to the problem. Less trained individuals often recommend tooth extraction rather than retention. This condemns many teeth that could be treated and returned to good function. Even those teeth that are compromised have a much greater life span than the average implant[1]."

Dentists today do not understand that crowns and bridges—when properly fabricated--are *corrective* and not mere "tooth coverings." Corrective Dentistry on natural tooth abutments is possible because of Wolff's Law[3], which states that bone is deposited and resorbed in accordance with the stresses placed upon it. Corrective Crown and bridge restorations are designed with principles of ideal architecture that minimize forces on the supporting structures and compensate for existing periodontal bone loss. This approach *prevents* future bone loss. Designing crowns and bridges on the model of the Mason Jar Cover also prevents recurrent decay. The Mason Jar Cover is the best-known means ever devised for food preservation.[4] With a long apron to grip the root surface, this design also offers superior retention, so crowns do not fall out—even when they are not permanently cemented.

[**Fig. 1-3** Caption: Nine-year X-Rays show no sign of periodontal bone loss or recurrent decay. Fixed Bridgework solved the patient's problems for the entire quadrant. A single tooth implant only fills a space and would not solve any other problems in that quadrant.]

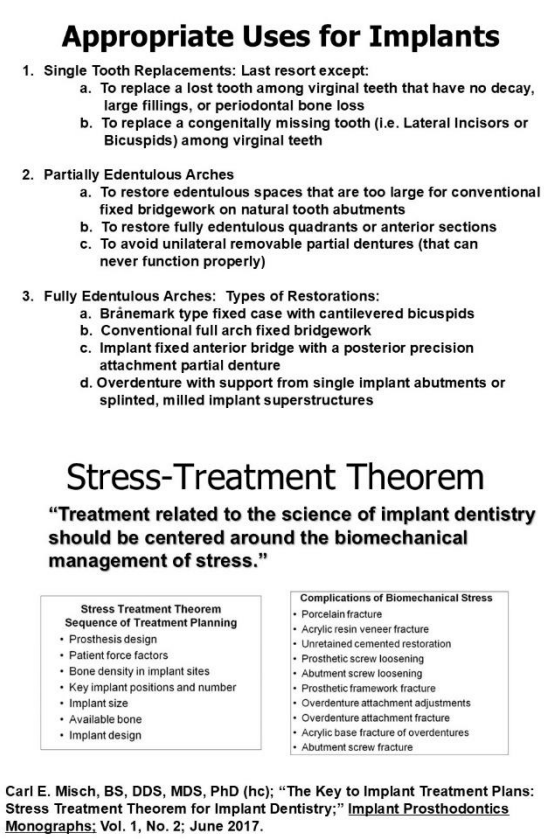
It is rare to find presentations and articles where single-tooth osseointegrated implants are placed among virginal teeth with no periodontal bone loss. Most of the time the teeth surrounding the implant are already compromised with crowns, fillings, periodontal bone loss or will require crown and bridgework in the future. In these cases, bridgework is a better treatment option than a single-tooth implant because it completely solves the patient's problem in the entire quadrant. By contrast, the single tooth implant does nothing for the teeth around it and the patient's problems are never solved. The single-tooth implant is the signature of a **piecemeal approach** to patient care, whereas bridgework is the signature of an overall approach to patient care. Contrary to the prevailing viewpoint, not every edentulous space requires an implant.

One of the reasons for the absolute epidemic of tooth extraction and implant placement is that the mainstream approach to full coverage restorations is based on ideas that did not come from Dentistry's roots. In fact, the mainstream approach actually *violates* the basic principles of success and longevity that allowed my father and I to have so much success. My father was a pioneer in full mouth reconstruction and crown and bridge Dentistry, and I followed his footsteps carefully. Together we have 70 years of documented crown and bridge cases that go back to 1950—all the teeth prepared and handled the same way, and the cases followed for *decades*—with X-Rays.[4]

It is my observation that dentists shy away from crown and bridge procedures because they are having a great deal of difficulty with them—specifically with recurrent decay and loss of retention. These problems were actually solved in the 1930s! Often dentists only have implant therapy in their treatment armamentarium, so their solution to every restorative problem is to place implants. I have seen instructors from famous institutes go out of their way to promote complex, invasive treatments when clearly the best solution would have been a tried-and-true six-unit bridge! The overuse of implant therapy as a restorative solution is a sure recipe for failure.

The reality is that not everyone is a good candidate for implant therapy. Implants must be placed deep enough to support the restoration, and if it is not possible to place adequate implants, they shouldn't be placed. Areas of spongy bone, large sinus cavities and lack of bone above the inferior alveolar bone are areas of poor prognosis for implant therapy.

Appropriate Management of Implant Restorations



Appropriate Uses for Implants

1. Single Tooth Replacements: Last resort except:
   a. To replace a lost tooth among virginal teeth that have no decay, large fillings, or periodontal bone loss
   b. To replace a congenitally missing tooth (i.e. Lateral Incisors or Bicuspids) among virginal teeth
2. Partially Edentulous Arches
   a. To restore edentulous spaces that are too large for conventional fixed bridgework on natural tooth abutments
   b. To restore fully edentulous quadrants or anterior sections
   c. To avoid unilateral removable partial dentures (that can never function properly)
3. Fully Edentulous Arches: Types of Restorations:
   a. Brånemark type fixed case with cantilevered bicuspids
   b. Conventional full arch fixed bridgework
   c. Implant fixed anterior bridge with a posterior precision attachment partial denture
   d. Overdenture with support from single implant abutments or splinted, milled implant superstructures

Stress-Treatment Theorem

"Treatment related to the science of implant dentistry should be centered around the biomechanical management of stress."

Stress Treatment Theorem
Sequence of Treatment Planning
- Prosthesis design
- Patient force factors
- Bone density in implant sites
- Key implant positions and number
- Implant size
- Available bone
- Implant design

Complications of Biomechanical Stress
- Porcelain fracture
- Acrylic resin veneer fracture
- Unretained cemented restoration
- Prosthetic screw loosening
- Abutment screw loosening
- Prosthetic framework fracture
- Overdenture attachment adjustments
- Overdenture attachment fracture
- Acrylic base fracture of overdentures
- Abutment screw fracture

Carl E. Misch, BS, DDS, MDS, PhD (hc); "The Key to Implant Treatment Plans: Stress Treatment Theorem for Implant Dentistry;" Implant Prosthodontics Monographs; Vol. 1, No. 2; June 2017.

However, if a patient is a good candidate for implant therapy, implants are wonderful restorations. The key to success with implants is to use them appropriately. Many dentists believe that fixed bridgework on implants is always the best treatment choice. The truth is that there are multiple options for treatment with implants—and fixed bridgework is *not* always the best choice. Choosing the best option depends on several factors—the fixture support, the type of bone and the quantity of lost tissues that must be replaced. **[Fig 4]**

Carl Misch, an expert researcher in the field of implant biomechanics, conducted extensive research on implant loading and he outlined how implants are to be optimally handled in his stress treatment theorem. He states emphatically that **"treatment related to the science of implant dentistry should be centered around the biomechanical management of stress[5]."** **[Fig 5]**

Carl Misch also emphasizes that natural teeth have the ability to recover from trauma because of the periodontal ligament. Implants, however, have no such ligament. "Compared with a tooth, the direct bony interface with an implant is not as resilient. No cortical lining is present around the implant, which indicates the forces are not dissipated ideally around the interface. Instead, the energy imparted by an occlusal force is not dissipated away from the crestal region, but rather transmits a higher intensity force to the crestal contiguous bone interface.[5]" Once bone is lost around an implant fixture, there will be no recovery even if traumatic forces are removed.

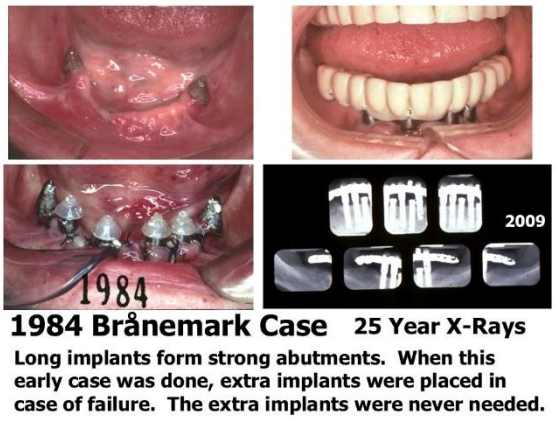
In the past, almost all implant fixtures exhibited a small amount of crestal bone loss immediately after placement before stable bone[6] remodeling halted the progression of bone loss. Today it is possible to place implants according to "zero-bone-loss concepts", so that no crestal bone loss is detectable.[6]

Once the implant fixtures have been properly placed and osseo-integrated, restorations must be designed to minimize the loads they will have to bear. Overloaded implant fixtures will result in an engineering failure, despite successful osseointegration. Carl Misch's Stress-Treatment Theorem

outlines a variety of biomechanical pitfalls that could compromise overall all case success and longevity. As the famous engineering expert Henry Petroski often remarked, that success is foreseeing failure: "for it is only by recognizing the possible ways of failure that a successful structure can be designed to resist the forces that might tear part from part:[8]"

One obvious pitfall is the presence of parafunctional habits. Parafunctional habits are well known sources of deleterious forces that can destroy implant fixtures and restorations. Often these habits arise from neuromuscular-occlusal disharmony. Neuromuscular-occlusal disharmony must therefore be addressed first--before implant fixtures are placed. Otherwise, the same failure that occurred with the natural dentition is likely to occur with the implant dentition. Patients with parafunction should be managed carefully and may require protective appliances after their cases are fabricated.

Prevention of peri-implant bone loss also depends on careful consideration of several other factors that might contribute to failure and mitigating them.



1984 Brånemark Case **25 Year X-Rays**

Long implants form strong abutments. When this early case was done, extra implants were placed in case of failure. The extra implants were never needed.

The Use of Cantilevers

Dr. Brånemark brought the osseointegrated implant to this country after 20 years of intensive study and research. His protocol consisted of placing 4-5 fixtures anteriorly with cantilevered bicuspids. The anterior region usually has adequate bone depth and quality for the placement of implants, while the posterior regions may not provide enough bone to place implants of adequate depth to support bridgework. Abutments supported the restoration in high-water design to allow access for adequate hygiene. The Brånemark concept was essentially to screw a denture (or part of a denture) into the fixture abutments.[2] **[Fig. 6]**

However, the Brånemark protocol applied basic principles of engineering to avoid placing too much stress on the implant fixtures. It is well known that cantilevers apply additional stress on the implants and can contribute to crestal bone loss (especially around the nearest abutments) that may or may not continue. Acceptable cantilever length varies and depends on the width of the edentulous space, the abutment support and overall function and esthetics. **[Fig. 7]**

Considerations when planning Cantilevers

1. Width of Edentulous Space
2. Abutment Support
   - Number of Abutments
   - Length of Abutments (especially the nearest abutment)
   - Periodontal Bone
   - Health/Age of Patient
3. Overall Esthetics

The traditional guide for calculating the ideal length of cantilevers is the A-P spread formula. The AP spread is defined as the distance from the most anterior part of the most anterior implant to the most posterior part of the most distal implant[7]. There is disagreement, however, about how to determine cantilever length from the A-P spread. Numerous authors have suggested the following amounts of AP spread that could be used to determine distal cantilever length on an implant-supported fixed full-arch prosthesis: less than 1, 1.5, 2, and 2.5mm. These measurements translate to cantilever lengths of

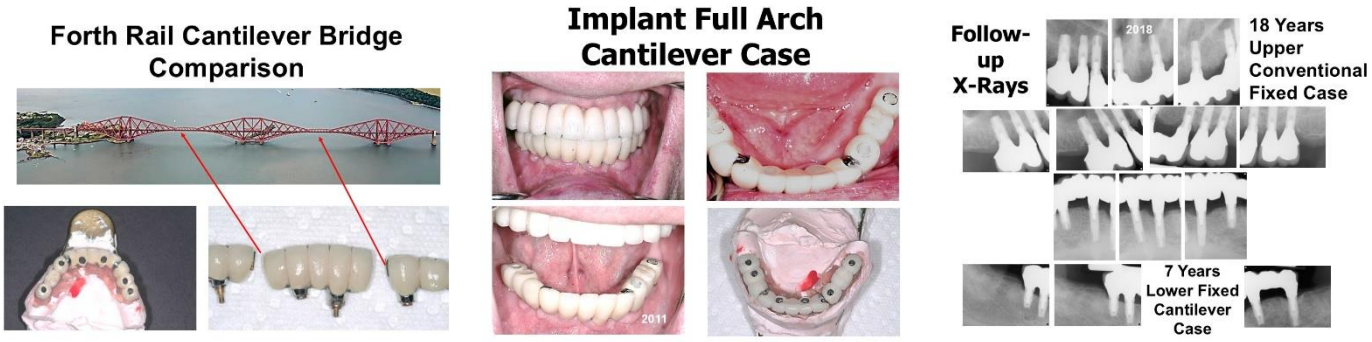
1-3 bicuspids. Misch and Misch-Dietsch suggested that a 2.5mm A-P spread was possible when abnormal forces (e.g. from parafunction) are low and there is ideal prosthetic support (that is, adequate number and length of implant fixtures). In short, the clinician must carefully decide an appropriate cantilever length for each individual circumstance that is based on careful analysis of fixture support and bone quality.[9]

If the patient has adequate posterior bone for good, long implants, full arch bridgework is an excellent treatment option. However, full-arch roundhouse bridgework may not fit—especially if it is heated repeatedly to temperatures close to the metal substructure's melting point (as with porcelain firing). A better choice for roundhouse bridgework—especially in patients prone to porcelain breakage—is composite-to-metal restoration. This choice avoids the heat of porcelain application. Composite is less prone to breakage and much easier to repair than porcelain. The composite often can be repaired intraorally without removing the case. When using composite, the metal should be designed properly for retention with fine sprue wires. This was the design of the original gold and processed acrylic restorations that came from Dentistry's roots. Often laboratories sprinkle beads on the restoration (analog or digital) for retention. Clinical experience demonstrates that beads are not all that retentive.[10]

A better option than restoration of the arch with a single roundhouse is segmentation of the arch with several bridges. Segmentation into three segments is recommended by Dr. Tomas Linkevičius[11] and others. Segmentation allows the operator to have control if a complication occurs with one of the implant bridges so that the entire case is not in jeopardy. The ideal segmentation arrangement is an anterior bridge extending from canine-to-canine positions and two posterior bridges with no cantilevers. A minimum of seven implants must be placed to achieve this configuration. In order to achieve an ideal result, it is imperative that implants are properly positioned.

If the implants cannot be placed in the desired tooth positions, the cantilever concept can be applied to achieve full arch splinting with segmentation. Separate bridges can be connected with male/female attachments. The anterior section contains the females, and the posterior sections connect to it with males. This is the design of many structural engineered bridges—the most famous being the Forth Rail Bridge in East Scotland.

[Fig 8,9 and 10 CAPTION:



Cantilever Bridge Concept applied to Full Arch Bridgework with Implant Abutments]

The drawback of this design is that screws may loosen periodically, but occasional screw loosening is a small price to pay in order to enjoy the benefits of full arch splinting and retrievability.

The original concept that came from Brånemark for full arch bridgework was to screw a denture or portion of a denture into the implants. This concept still rules the implant full-arch restoration landscape. A better concept, however, is to treat full arch restorations as if the fixtures were actually natural tooth abutments. This concept mandates that implants be placed in the correct tooth positions with ideal emergence profiles to facilitate hygiene. The use of surgical stents to place implants is therefore a MUST! The stents can be made by hand or digitally designed from computer-generated CBCT scans.

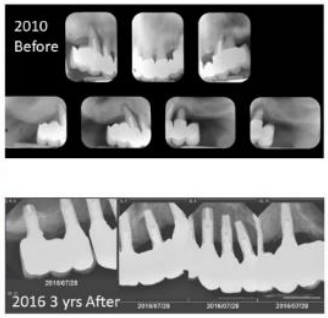
2. **Splinting**

The concept of splinting is not new. It has been used for cases on natural tooth abutments for decades as a means of distributing stress among a group of teeth so that individual teeth do not have to bear the brunt of forces alone. It is a well-known fact that natural teeth that have mobility "tighten" when they are splinted. Dr. Elliot Feinberg often remarked in his courses that "once the tolerance level of the individual patient is reached, periodontal destruction will increase at an even faster rate. If treatment is not initiated to restore a better harmony between the altered structure and the function of the area, breakdown will continue until the teeth are eventually lost. Splinting of teeth is usually the choice of treatment."[12]

It stands to reason that splinting should be the treatment of choice for implants as well as for natural tooth abutments. Splinting is an important tool for minimizing biomechanical stress on implants and should be used wherever there are multiple fixtures that require restoration. Splinting implants together also avoids the possibility of food impaction, a known contributor to peri-implant bone loss. Perhaps the best advantage of splinting is the contingency it provides in the event an implant fixture fails, since the patient will still be able to wear the bridgework provisionally or permanently.

3. Minimize the Bucco-Lingual dimension and size of restorations

This case was done at the level of the implant in stages and is "half" Brånemark Case, since the patient did have sinus lift surgery on one side.



Notice the narrow bucco-lingual width and the sleek metal lingual surfaces anteriorly. The screw holes generally correspond to individual teeth, making hygiene easy for the patient.

An important means of minimizing the biomechanical forces on implant fixtures is to create restorations with narrow bucco-lingual dimensions. Creating large superstructures on implant fixtures is a sure recipe for restoration overload and ultimate failure.

The lingual aspect of anterior restorations should be made as thin and sleek as possible. In order to achieve this ideal, the lingual surfaces can be fabricated solely with polished metal. **[Fig 11]**

In examining the cases illustrated in Brånemark's epic osseointegration book, all of the cases exhibited extremely narrow bucco-lingual

dimensions. Perhaps this design greatly contributed to the high percentage of success with the Brånemark implant restorations.[13]

Adding pink material to the buccal aspect of the restoration in order to compensate for the loss of gingiva and bone is a common practice that hails from the concept of screwing a denture into the implants. However, implant fixtures are more akin to tooth replacements and should be treated as such. Extra pink material overloads the bridgework and is often not visible when the patient smiles. The teeth will no doubt appear longer without the pink material, but the extra length is usually hidden by the lips when the patient smiles. When creating fixed implant cases, structure and function must take precedence over esthetics. If too much bone and gingiva has been lost so that the restoration cannot adequately support the lip without the pink material, an overdenture would be a better treatment option than overloaded fixed bridgework.

4. Screw-hole Access vs. Cementation over abutments.

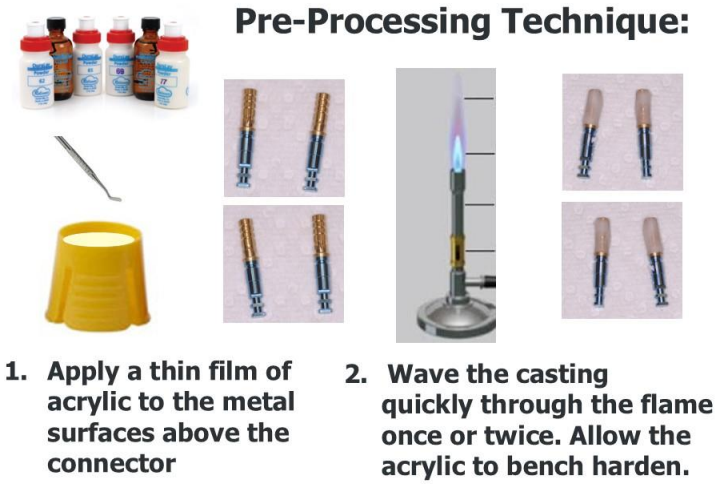
The best strategy for the long-term success of implant restorations is screw-hole access for retrievability. Implant restorations, like natural tooth restorations, are not lifetime. At some point complications may occur from continuous function in the harsh oral environment under forces. Screw-hole access allows retrievability and minimal complications for the patients. It is not unusual for screws to loosen after a restoration has provided many years of service. Screw-hole access allows the restoration to be unscrewed, cleaned, examined and re-inserted with screws replaced or tightened. The screw-holes should be on the occlusal or lingual. When the position of the screw hole is less than ideal, the use of angulated abutments that allow for proper screw-hole access is the recommended corrective strategy.

Screw-retained restorations also contribute to healthier peri-implant tissues. Tomas Linkevičius pointed out that a 2011 study concluded that it is not possible to remove cement remnants from the subgingival margins of the abutments.[14] Cement remnants can cause acute peri-implantitis or peri-implantitis that is delayed or chronic. Cement has a rough surface that attracts bacteria. He noted that natural teeth have the periodontal ligament to provide a barrier to the cement. As a result, excess cement is expelled from the sulcus and remnants are easy to clean. Implants have no such periodontal ligament barrier. As a result, cement remnants are pushed deeper in the crevice toward the bone, where they are difficult or impossible to remove and result in inflammatory processes that affect the crestal bone. Dr. Linkevičius concludes that “the only reliable way to ensure complete removal of cement remnants is to use custom abutments without any undercut and with supragingival margins. This design allows cement to be easily seen and removed. Dr. Linkevičius has also observed that screw-retained restorations have tighter marginal fit than cemented restorations.[15]

The abutment-overlay strategy has another disadvantages as well. It is not uncommon for stock abutments to provide poor retention of cemented restorations or result in subgingival cement remnants that can lead to peri-implant failure. It is also important to realize that if components loosen under overlay bridgework, it is likely that the restoration will be impossible to remove without destroying the overlay. The costs of remaking a new overlay will make for a very unhappy patient. The use of overlays to cover improper screw-hole access should therefore be confined as much as possible to those abutments with poor screw-hole position. **[Fig 12]**

Wherever possible, the operator should work at the level of the implant to make custom-designed screw-retained restorations with the correct emergence profile and ideal embrasure spaces.

5. Fool-proof Protocol: Use the Provisional Restoration as a Blueprint for the Final Restoration



Once the implants are uncovered, an ideal provisional restoration with the correct emergence profile should be created in order to correctly shape the gingiva. Metal temporary cylinders are the most accurate and stable copings. They should be the option of choice to create provisional restorations because they can also act as transfer copings for the master impression. The metal cylinders should be pre-processed with acrylic or composite. Acrylic or Composite can then be added either in the mouth or on preliminary models to create the ideal provisional restoration. If models are used, the components should be split and re-connected in the mouth because the preliminary model is not accurate enough to guarantee fit. Be sure to verify complete seating on the fixtures with X-Rays before connecting the components intra-orally.[16] **[Fig 13]**

Indirect Approach for making implant provisionals

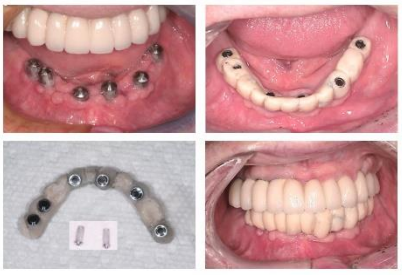
Connecting Implant Copings in the Mouth

[Fig 14 and 15]

After insertion, the provisional restoration should be observed closely to verify esthetics, emergence profile, function, and comfort. Any changes required should be instituted in the provisional restoration before the final restoration is fabricated.

Once satisfied, the operator can use the provisional restoration to fabricate master models while the patient sits in the chair. All the required information for a permanent restoration is encoded in the provisional restoration, and this information is easily transferable to master models in this manner. This approach ensures that the final restoration will be properly constructed so it will not stretch or pinch the tissue when it is inserted fully. It will feel completely comfortable immediately upon insertion and the patient will not have to wear something that he or she must "get used to.

Provisionals are the Blueprint



Master Impression Using Provisionals

Mounted Master Model

[**Fig 15, 16, 17** Caption: The use of provisional restorations to fabricate the master model guarantees that the final restoration will be made exactly as desired.

1. Take a wax bite and have a model of the opposing arch ready. Simply take a full arch impression of the provisional restoration with any impression material.

2. Remove the provisional restoration from the mouth. While the patient waits in the chair, take the impression, the wax bite, the opposing model and the model analogs into the laboratory. Screw in the model analogs into the metal cylinders so they are adequately tight and completely seated.
3. Place the provisional restoration into the impression.
4. Squirt some gingival mask around the analogs.
5. Box and pour the model with a quick-setting stone like Snap Stone™. After the stone sets, separate the model from the impression and mount it with the wax bite against the opposing model with quick-set plaster or stone on an articulator.
6. Remove the provisional restoration, clean it and re-insert in the patient's mouth. The models are an exact replica of the mouth, and they are perfect for the fabrication of the final restoration. A model of the provisional restoration can also be given to the technician to serve as a guide.]

6. Use alternative treatment options with fixtures that cannot properly support full arch fixed restorations.

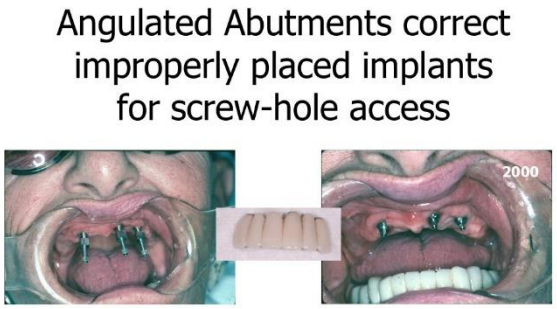
Not only are inadequate implants commonly placed in areas of poor bone, but there seems to be an epidemic of restoring them with over-sized restorations. This overload adds insult to injury--increasing the likelihood of failure. It is important to recognize that implants are feats of structural engineering and, as such, must be treated with basic engineering principles. They can osseointegrate perfectly, but if they are overloaded with forces, they are certain to fail. The structural civil engineering world is replete with failures of overloaded bridges, where the architects miscalculated the forces that would be acting on the foundation supports. For every type of failure in the civil engineering world, there is a corresponding type of failure in the dental world. It is a universal fact that **all** engineered structures improperly supported *will* fail.

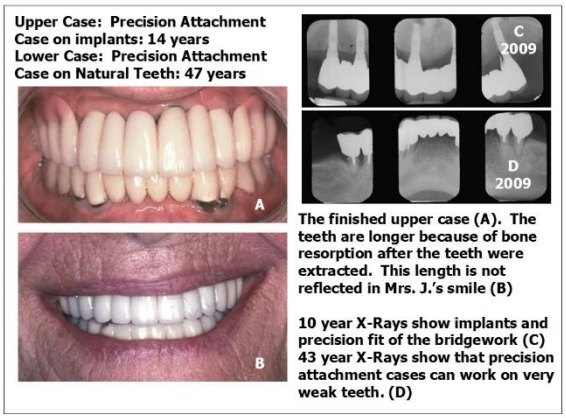
The All-on-Four or All-on-X concept positions a minimum of four implants strategically to support full arch bridgework—usually two in the anterior region and two in the posterior regions of the mouth. The bony ridge is usually flattened to place the implants. Often it is impossible to place implants of adequate length in the posterior regions of the arch, and it is not uncommon for the operator to mesially tilt the posterior implants in order to achieve greater bony surface area for osseointegration. Implants with significant inclination will absorb forces at abnormal angles instead of along their vertical axes. . This configuration is not ideal for the dissipation of applied forces.

There seems to be a common practice of overloading all-on-four fixtures with a large superstructures that not only restore the missing teeth, but the missing gingiva and bone as well. Some of these restorations are designed in such a way as to make home hygiene care all but impossible. Brånemark never made his original cases in this manner. His cases were designed with denture-like superstructures, but had narrow bucco-lingual diameters with "high-water" design so that the patients could access the implant abutments to keep them clean. Lack of hygiene and overloaded fixtures are a sure recipe for failure. When all-on-four cases fail, the patient may not be a candidate for new implants. Worse, the patient may not even be able to comfortably wear a denture because the ridges have been flattened.

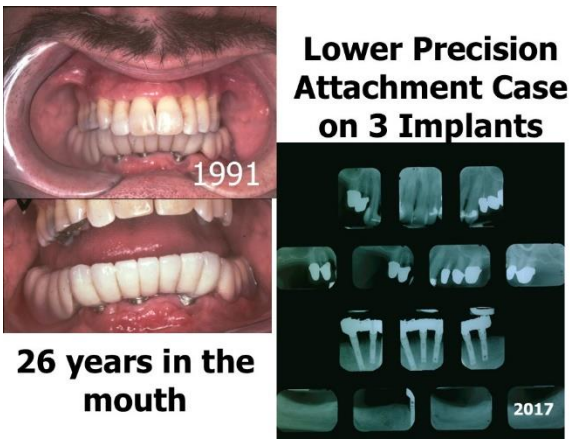
There are two great alternatives to full arch restoration when implant fixtures cannot support fixed bridgework. These alternatives incorporate removable components into the full arch design. Dentists and patients alike loathe the idea of removables because they move. Some dentists feel that fixed dentistry is ALWAYS better than removables for this reason. This idea is false. Although removables are subject to the dislodging forces of musculature and gravity, they can be designed for stability and minimal movement. Dentists would be surprised to learn what patients choose when alternatives are properly explained, and patients are given choices. The use of removable components minimizes the need for numerous implants and extensive surgery, and this reduction also translates to reduced cost.

A. The Double-Tilt Precision Attachment Case:





[Fig 19 and 20] Usually, the anterior section of the mouth has better bone quality than the posterior section. Often good, long implants can be placed anteriorly, but not posteriorly. It is possible to place three implants (one in each canine location and one in the central incisor location and make a fixed bridge with a double-tilt precision attachment posterior partial denture. In treatment planning this case, the operator stays away from sinus lift surgery, interference with the inferior alveolar nerve, and placing implants in inferior quality bone.



[Fig 21] The double tilt precision attachment case has a long track record of success on natural tooth abutments that dates back to 1906. The double-tilt precision attachment case has been successful on the weakest natural tooth abutments imaginable. Imagine how it could work on implants that are strong! In fact, the double-tilt precision attachment case has proven successful with implant abutments for over 25 years. Unfortunately, very few dentists know anything about this treatment option, as it not taught—and fewer still know how well this option works with implant abutments.[16]

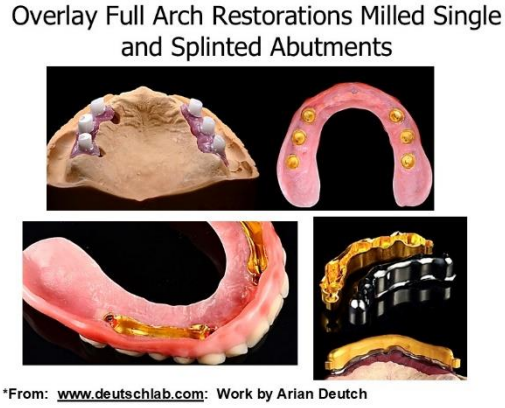
The attachment apparatus consists of a simple male-female attachment with no locking mechanism. Every locking mechanism on the market applies deleterious forces to the

abutments and function just like clasps. This history of clasp partials is that they are transitory restorations to a denture. By contrast, the male-female attachment has no locking mechanisms and functions passively. The retention mechanism consists of the double-tilt path of insertion; that is, the path of insertion is tilted in *two* directions on the surveyor. This path is different from the pull of the muscles and gravity, so if a stress is applied to the removable partial denture, it can move slightly to relieve the stress, but it cannot be dislodged. The result is mild physiologic stimulation of the abutments and edentulous ridges. This type of stress-release mechanism not only spares the abutments from deleterious forces, it also avoids crestal bone loss as a result of Frost's Law[17], which states that mild stimulation of the bone results in bone apposition.

The removable partial denture is only removed for hygiene, and it is worn 24 hours a day. Replacement of attachment parts is a rarity, even after *decades* of continuous wear. The double-tilt precision attachment case has the best track record for longevity, and the average case lasts longer than the average fixed bridgework case. There is also very little maintenance. If the partial denture becomes loose, all that is necessary is a simple reline.

B. Implant-supported Overdenture.

Overdenture attachments, such as the locator attachment, are usually designed to grip and lock onto the implant abutments. This locking action applies deleterious forces to the implant abutments that can eventually result in their loss. A better strategy is to create an overdenture that simply rests on implant abutments or milled structures that connect the implants above the gingiva. More than adequate retention can be achieved with this strategy without having the overdenture grip or lock onto the fixtures.



[Fig 22] Arian Deutsch, the owner of Deutsch Dental Laboratory in Surprise, AZ, fabricates precisely milled and polished abutments or bar connectors for the implant fixtures. He then creates precisely fitting custom-made copings for the abutments or sleeves for the milled bars. The copings and sleeves consist of thin, electrochemically deposited 24-carat gold. Unlike castings made with 24 carat gold, electrochemically deposited gold is extremely strong and unbendable. They fit like gloves. The gold copings or sleeves become part of the overdenture to make the most precisely fitting overdentures. Unlike other treatment options, the overdenture has a built-in contingency plan: If one of the implants should fail, nothing has to be remade.[18]

Summary:

Dentists must consider many factors when treatment planning for full arch implant restorations. Except in certain circumstances, implants should be treated as a last resort rather than as a first resort.

As Carl Misch once noted, implant treatment must be centered around the management of biomechanical stress. The fixtures must be placed so that they can adequately support the restoration and placed in the correct tooth positions. They should be placed according to zero-bone loss concepts to minimize crestal bone loss. Fixed bridgework must be designed to minimize forces on the implant fixtures. The design includes factors like proper emergence profile to facilitate hygiene, narrow bucco-lingual diameters, splinting to distribute the stress load, and screw-hole access to avoid cement remnants and ensure retrievability. When implant fixtures cannot support fixed bridgework, removable restorations have a better prognosis for case longevity. **[Fig 23]**

Guidelines for Implant Restorations

1. **Splint wherever possible.**
2. **Use ideal splinting arrangements where possible.**
3. **Work at the level of the implant to create ideal architecture.**
4. **Minimize the bucco-lingual diameter of implant restorations.**
5. **Use the provisional restoration to create a blueprint for the permanent restoration to control emergence profile, tissue esthetics and to assure that the final restoration will have proper esthetics and function.**
6. **Use the provisional restoration to create the master models. All the information required for a successful outcome has already been verified in the provisional restoration.**
7. **Always make stents for implant placement. Implant placement must be restoratively driven.**
8. **Plan for Screw Hole access wherever possible: Use angulated abutments if necessary for proper access. If overlays are required to cover the screw hole, minimize their use to facilitate retrievability.**
9. **Don't Connect Implants with Natural Teeth.**

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[3]Wikipedia: https://en.wikipedia.org/wiki/Wolff%27s_law.
[4]See www.theONWARDprogram.com. There are several courses that go into great detail on this concept and the technique for accomplishing these goals. The whole philosophical approach to crown and bridgework is outlined in the 4 philosophy courses (which are free).
[5]Carl E. Misch, BS, DDS, MDS, PhD (hc); "The Key to Implant Treatment Plans: Stress Treatment Theorem for Implant Dentistry;" Implant Prosthodontics Monographs; Vol. 1, No. 2; June 2017.

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[8]Petroski, Henry, To Engineer is Human; Vintage Books, 1982; p. 216.
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[11]Linkevičius, Tomas, DDS Dip Pros, PhD; with contributions from Algirdas Puišys, DDS Spec Perio, PhD; and Rolandas Andrijauskas, CDT, MDT; Zero Bone Loss Concepts, Quintessence Publishing, 2019; p. 198.
[12]Dr. Elliot Feinberg presented two seven-session courses annually for 40 years, with patient demonstrations and slide lectures. One course covered the philosophy and technique of fabricating fixed bridgework, and the second course covered the philosophy and technique of fabricating a precision attachment case.
[13] Per-Ingvar Brånemark, with Shu Chien, Hans-Göran Gröndahl , Kingsley Robinson, Barbro K. Brånemark and a compilation of 55 authors from Sweden, Chile, United Kingdom, United States, Canada, Brazil, Belgium, France; The Osseointegration Book: From Calvarium to Calcaneus; Quintessenz Verlags-GmbH ©2005.
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[16]Feinberg, Edward; The Double-Tilt Precision Attachment Case for Natural Teeth and Implants; 2015; available on Amazon.com.
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[18]Deutsch Dental Arts; 13920 W. Camino Del Sol, Suite 2; Sun City West, AZ 85375 arian@deutschlab.com; www.deutschlab.com.