DENTAL IMPLANTS

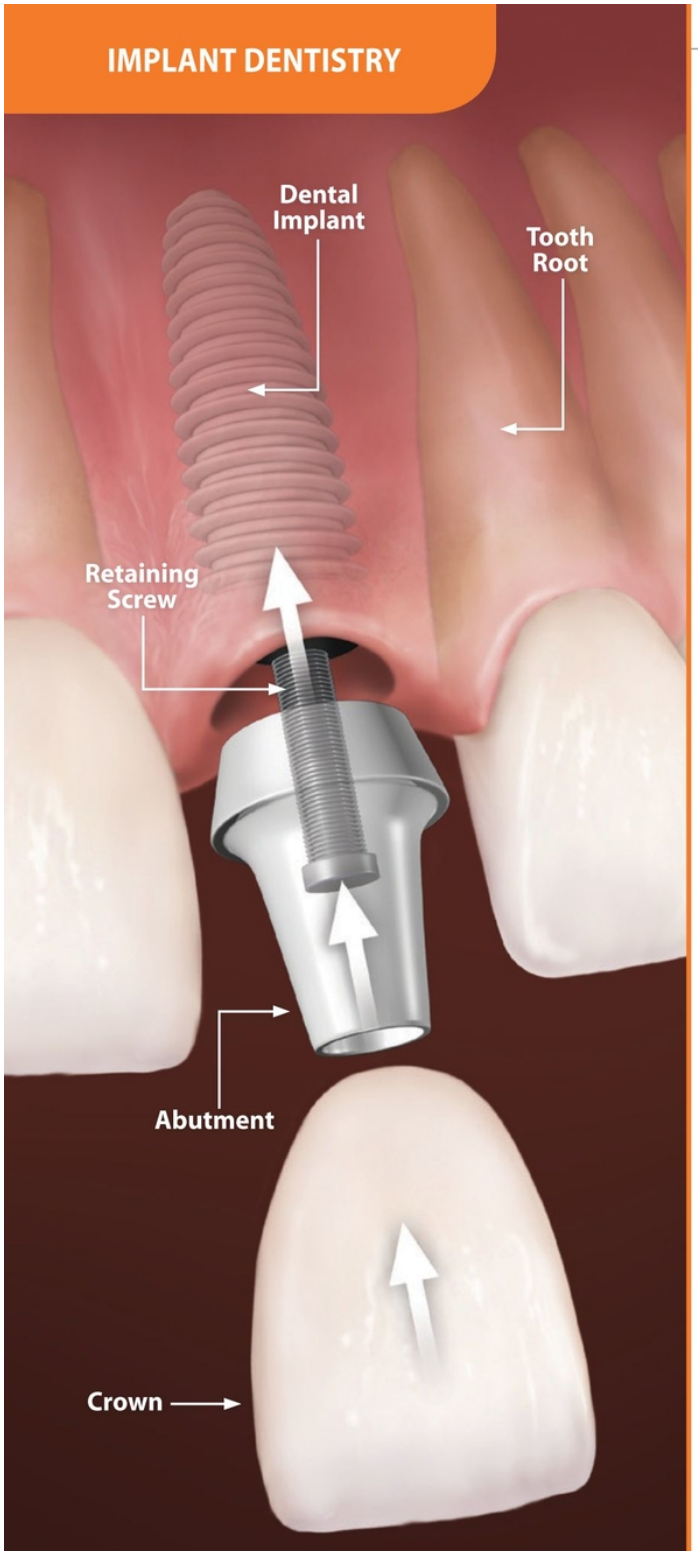
Your Best Option For Replacing Teeth

by Edwin S. Rosenberg, BDS, H. DIP. DENT, DMD

There is no question that dental implants have revolutionized tooth replacement and the practice of dentistry. Today's highly successful dental implants consist of an artificial tooth root, to which a crown is attached. This system looks just like the natural teeth in your mouth when you smile; there is no visible difference. In addition, implants do not decay and are relatively free from developing gum disease.

The practice of implant dentistry requires expertise in planning, surgical placement and crown fabrication; it is as much about art and experience as it is about science. It also requires teamwork between you and your dentist, an implant surgeon, and a dental technician.

IMPLANT DENTISTRY



Dental implants have been called the most significant dental innovation of our generation for good reason.

WHAT IS A DENTAL IMPLANT?

Teeth essentially have two main parts: the crown — the part above the gum tissues, and the root — the part that is suspended in the bone by the periodontal ligament (peri-around, odont-tooth). A dental or endosseous implant (endo – inside, osseous – bone) is actually a replacement for just the root part of the tooth, but unlike the natural root an implant becomes physically anchored in the bone of the jaw that once held a natural tooth or teeth.

The amazing thing about modern dental implants is that they actually fuse with, or "integrate" into the bone, a process known as "osseo-integration" (osseo-bone, integrate – to become part of). They are, for the most part, made of commercially pure titanium, a metallic substance used for many years in medicine and dentistry because it is not rejected by the body, being osteophilic (bone-loving). The actual process of osseo-integration is essentially a biochemical fusion of living bone cells and bone substance to an oxide layer that forms on the surface of the titanium.

CHANCE FINDINGS IN SCIENCE

As with many scientific advances, the discovery of osseo-integration was, happily, quite by chance! In 1952, Dr. P. I. Branemark, a Swedish orthopedic surgeon, was studying healing in the bones of a rabbit limb. When the study was completed it was noted that the titanium optical chamber had fused to the bone and could not be removed.

Dental implants were first introduced for people who had lost all of their teeth and who had great difficulty stabilizing or tolerating dentures. When teeth are lost and bone is no longer supporting or connected to teeth, bone resorption occurs. Because dental implants fuse to the bone, they stabilize it and prevent further bone loss.

Since their introduction into dental practice in the late 1970s, dental implants have undergone many improvements in design. The implants first used in the pioneering "Branemark" system were basically a one-size-fits-all design with only the length being variable. Surfaces of the implants were smooth and polished.

Clinical use and research has led to many improvements. For example, the implant surface is now roughened to increase surface area. This also increases the success rates of osseo-integration, even where bone quality is less dense. Implants now come in different shapes and sizes that correspond to the types of teeth they are replacing so they can more easily carry the same forces as those applied to natural teeth. A spiral screw-like shape maximizes bone-to-implant contact. And connections from implants to crowns have improved to make the teeth look perfectly natural as they emerge from the gum tissues.

THE DENTAL IMPLANT PROCEDURE

Diagnostic steps

Your dentist and/or surgeon will follow routine procedures to assess your medical status and general health; carefully examine the site where the potential implant or implants are to be placed; assess your bite; and evaluate any aesthetic concerns. Special radiographs (x-rays) to assess bone quantity and quality may be necessary.

Implant positioning

A combination of specialized radiographs (x-rays) and imaging technology is used to assure the underlying bone allows for successful implant placement and to avoid major structures like nerves and air sinuses. From this information, a surgical guide is often fabricated to assist in precise implant placement, which in turn assures that a crown will fit in the right position.

Surgical placement

Dental implant surgery is a relatively comfortable procedure usually carried out under local anesthesia, sometimes with the assistance of sedatives for particularly anxious patients. Some minor vibration is generally experienced during the implant (bone) site preparation, in which a small hole is made in the bone to receive the implant. Since there are no open wounds following the surgery, there is little post-operative discomfort. The implant(s) usually need to be left for a period of two to three months to fuse with the bone. The more dense the bone, the quicker the integration. Once the implant has integrated with the bone, a crown can be made and the implant can be subjected to biting forces.

ONE- AND TWO-STAGE SYSTEMS

In the two-stage system, the implants are placed, covered with the gum tissue, and left to fuse to the bone. The implant is uncovered (stage two) two to three months later, and a small connector called a "healing abutment" is attached to the implant extending through the gum tissue.

In the one-stage system, the implant with its abutment or a temporary crown is left slightly protruding through the gum tissue. There is no additional surgery necessary and the final crown can be made after the implant has successfully fused to the bone.

Another option of the one-stage system is called an "immediate implant," meaning an implant is placed at the time of the extraction of a tooth. For this to happen, you need sufficient healthy bone into which an implant can be placed following tooth removal.

Sometimes a healing abutment is used for an immediate implant or if the implant is in a highly visible area of the mouth, a temporary crown could be placed. This temporary crown will be purely cosmetic and designed so that it doesn't contact the opposing teeth, which would disrupt healing.

There are times when an immediate implant can be functional right away. This is called "immediate implant loading," meaning the implant and crown can be subjected to biting forces right away. Multiple implants need to be splinted together to be successful. This procedure has slightly more risk and can only be carried out if the situation is appropriate.

All of the above systems have their particular merits and indications.

Dental implant surgery is a relatively comfortable procedure usually carried out under local anesthesia.

TYPES OF IMPLANT RESTORATIONS

There are now more than 40 different types of standard-size implants available. We also have various sized mini implants. Mini implants are like traditional implants but usually smaller in diameter. Being smaller and more screw-like in appearance, they can be used where bone width is inadequate for traditional implants, and are usually more cost-effective as well.

Types of Implant Restorations:

- **Single tooth replacements:** one implant supports a single crown [Fig. 1].
- **Multiple tooth replacements:** multiple missing teeth can be replaced with multiple implants supporting fixed bridgework. A dental bridge can be as small as three crowns supported by two implants, or multiple implants supporting a greater number of teeth (crowns). Usually a minimum number of four to eight implants are needed to replace a full arch (jaw) of teeth (10 or more crowns) by fixed bridgework [Fig. 2].
- **Combinations of fixed and removable bridgework:** generally where implants are used to support a section of fixed bridgework, to which a removable section is attached [Fig. 3].

STOCKBYTE/GETTY IMAGES

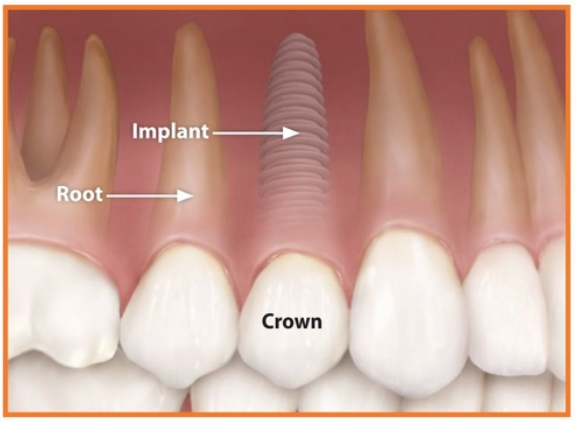


Figure 1: A full crown restoration placed on an individual implant.

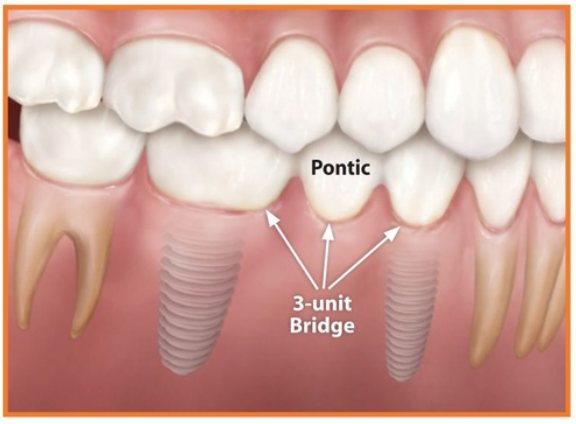


Figure 2: A three-unit bridge with a pontic (replacement tooth) placed between two implant crowns.

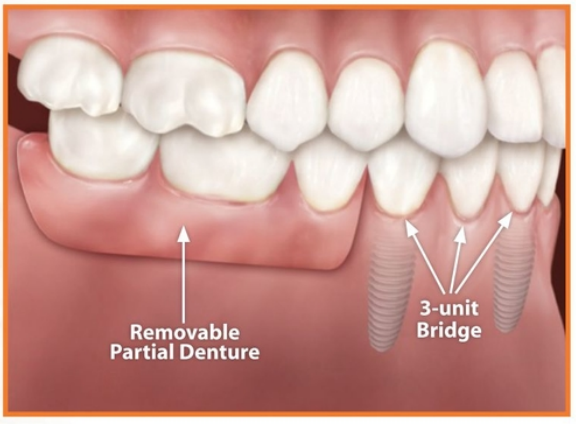


Figure 3: A permanent bridge supported by multiple implants which has attachments for a removable partial denture.

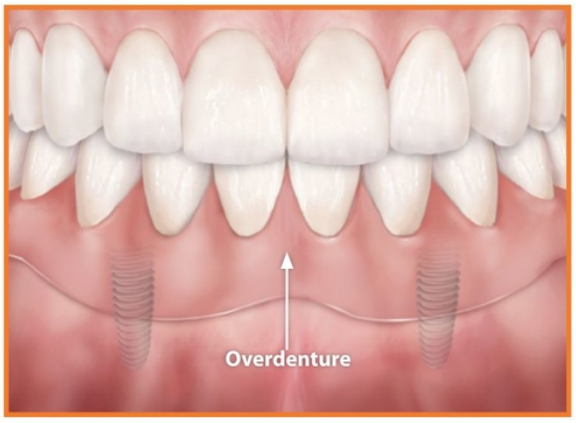


Figure 4: Two implants for attachment and stabilization of the mandibular (bottom) denture also protect the underlying bone.

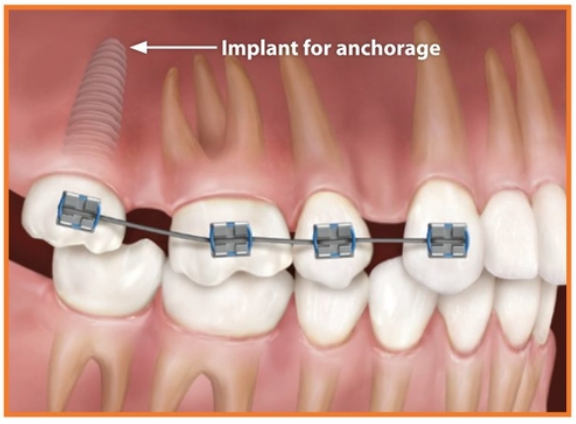


Figure 5: An implant can be used for anchorage during orthodontic therapy to straighten tipped teeth.

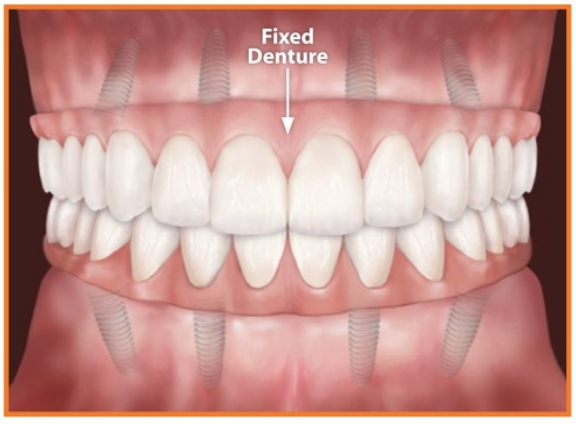


Figure 6: Four or more implants can be used to make a denture "fixed" into place rather than removable.

- **Over-dentures:** two or more implants, either standard or mini, are placed to provide stabilization of the denture and preserve the underlying bone. Whereas most traditional full dentures press directly on the gum and bone causing bone loss by resorption, implant-supported over-dentures protect the bone. Over-dentures are now considered the standard of care by the American Dental Association for those who have lost all of their teeth in one or both jaws [Fig. 4].

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- **Anchorage for tooth movement (orthodontics):** implants, either standard or mini are now being used to provide very stable anchor units to allow quicker and easier tooth movement [Fig. 5]

- **Fixed implant-supported dentures:** standard or mini implants allow a denture to be permanent rather than removable. A great option when much bone loss has occurred because the denture provides more support for the lips and cheeks [Fig. 6].

TECHNICAL CHALLENGES

Implants present aesthetic challenges in highly visible areas like the front of the mouth, particularly in people who show not only teeth when smiling, but the gum tissues as well. In such cases, the whole tooth/gum tissue complex must be recreated convincingly, including the "papillae" (those little pink triangles of gum tissue between the teeth). Other challenges include creating or generating bone and/or gum tissues where insufficiency exists. Both can be accomplished in today's world quite predictably with a variety of grafting, regenerative and plastic surgical techniques.

Implants have many advantages over other methods of tooth replacement, and in fact are now recognized as being the most cost-effective way to replace missing teeth.

IMPLANT SUCCESS

In the right situations, implant success rates are above 95% and have been documented and confirmed by vigorous research.

Implant success is dependent upon:

- Careful assessment, diagnosis, and understanding of the site where implant placement is sought
- The judgment, clinical experience, and collaborative efforts of the implant team

Implants have many advantages over other methods of tooth replacement, and in fact are now recognized as being the most cost-effective way to replace missing teeth. Though they may cost more up front than, say, bridgework, they have tremendous longevity for the following reasons: They become part of the jaw, they do not suffer from tooth decay, they are fairly resistant to gum disease, and they will never need a root canal. Once integrated and functional, today's dental implants can last a lifetime.

ABOUT THE AUTHOR

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Professor Edwin S. Rosenberg received his BDS and H. DIP. DENT at the University of Witwatersrand in South Africa. He earned his DMD and certificates in Periodontics and Periodontal Prosthesis at the University of Pennsylvania. He is currently Clinical Professor of: Implant Dentistry & Periodontics; Clinical Professor Surgical Sciences New York University; Medical College of Pennsylvania, Allegheny University & University of Southern California; Chairman and Director of The American Board of Periodontology. He is in private practice limited to periodontics, implant dentistry and prosthodontics. He is an internationally recognized researcher, author, lecturer and clinician.