

CANANDAIGUA ORAL SURGERY, PC

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BONE GRAFTING

It is not unusual for the patient to present for a consultation at the oral surgeon's office and be informed at some point in the discussion that he or she may require a **"bone graft"** in order to maximize the outcome of dental implant surgery. While this sounds pretty scary at first, the truth is that bone grafting in the oral cavity today is a routine, predictable and painless procedure.

A Brief History of Bone Grafting

As recent ago as the 1970's and 80's, before the renaissance of "dental implants", much of pre-prosthetic oral surgery was aimed at simply building a stable base for a denture in patients who had experienced severe atrophy of their jaws. Many of our readers may identify with this when remembering a mother, father, aunt or uncle who, at an earlier age, had lost his or her teeth and were now wearing dentures. Many may also recall being distracted by those individuals' dentures while they were either talking or eating. It was kind of like watching someone "rub their stomach and pat their head at the same time." Aunt Mildred's jaw and lips might go one way while her teeth were going a different way. While it was unfortunate and often embarrassing, it was certainly not the fault of the denture wearer. The fact is that as we age without teeth the underlying jawbone that supported the teeth atrophies with disuse. The truth is that the only reason our jaws have the amount of the bone that they do is because of the presence of existing teeth and the fact that those teeth are under continuous function. Once teeth are lost for one reason or another, the jaws quickly atrophy to a level of what is called "basal bone". In cases of a complete loss of teeth, this can leave behind only a narrow hoop of bone in the mandible (lower jaw) or a flat pancake of bone in the maxilla (upper jaw).

Extravagant and often complicated hospital based procedures were devised to address this atrophy and attempt to rebuild the jaws to a point where the patient could comfortably wear a stable denture and have confidence during normal masticatory function. It was not uncommon to use a patient's ribs to fashion a new hoop in an attempt to increase the vertical size of the lower jaw. Treatment was not only aimed at restoring function but in many cases to prevent a jaw fracture as the strength and size of the jaws were reduced with time. Skin grafts were sometimes harvested from the patient's thighs to be applied (grafted) intraorally in an effort to prevent the oral musculature from displacing the denture while the person was talking or eating. These more severe methods of preprosthetic surgery are nearly absent from today's treatment plans. The modernization of dental implants combined with a contemporary preventive approach to bone loss has virtually eliminated the need for such drastic measures.

Bone Grafting for Dental Implants

While the need for bone grafting has been significantly reduced, it has not been eliminated entirely. However, in most cases it is now relegated to small minimally invasive interventions that can be managed quite easily in an ambulatory (office) setting. Furthermore, while bone grafting of earlier

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years involved harvesting and using large quantities of the patient's own bone (autogenous grafts), today we can often use processed bone that has been harvested from animals (xenografts) or from human sources (allografts). These grafts are termed xenografts and are generally comprised only of the mineral content of natural bone, have been sterilized and have had all organic material removed. Using particulate bone (xenograft or allograft) as a graft material has become commonplace in most oral surgical offices today and has been a tried and proven technique for many years. A simplified explanation for the success of this form of grafting is that a bone graft is placed to act as a "biological placeholder." Initially, it mechanically prevents the collapse of the surrounding tissues, whether that is bone or soft tissue. Then, through a process called "guided tissue regeneration," the human body is fooled biochemically to recognize the graft as natural bone and over time resorbs and replaces it with the patient's own native bone.

Although major autogenous bone grafts are still occasionally required to provide a home for dental implants, the most common bone grafting required involves one or a combination of the following three simpler outpatient procedures:

1. The Alveolar Ridge Preservation Graft or "Socket Graft"
2. The Autogenous Ramus/Chin Graft or "Block Bone Graft"
3. The Subantral Graft or "Sinus Lift Procedure" When considering dental implants as an option, it is a likely possibility that your surgeon will discuss one or a combination of these grafts with you as a pre-requisite to optimize your treatment plan. Therefore, an explanation ensues below to clarify what each of these grafts is for and how they are typically accomplished.

The Alveolar Ridge Preservation Graft or "Socket" Graft

As discussed in the prior section on the "history of bone grafting," the simple extraction of a tooth leaves in its wake a hole that is surrounded by a shell of alveolar bone (tooth supporting bone). This bone's only purpose in the human body is to support a tooth. As a result, when the tooth is lost the body quickly begins to resorb the bone, unless it is immediately replaced with either another tooth, implant or in this case a "ridge preservation graft" (socket graft). Occasionally, it is possible to place an implant at the time of a tooth extraction. In these cases, the implant will act almost like a tent pole to hold the surrounding bone up and give it the functional requirements necessary to prevent it from undergoing atrophy. Unfortunately, often times it is impossible to place an implant at the time of the extraction. This can be for many reasons. However, it is most frequently due to either the presence of a dental infection or a size discrepancy between the tooth that is being lost and any possibility of an immediate implant replacement. In these cases it is prudent to place a "ridge preservation graft." The ridge graft is designed to fill the void left by the extracted tooth and hold the volume of this space while natural bone has the opportunity to proliferate and fill the space with high quality live bone.

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Depending on the size of the tooth that was extracted, the ridge graft requires between three to six months before an implant can be placed.

The graft is applied to the tooth socket immediately after a tooth extraction and is secured using a pledget of collagen and one or two dissolvable sutures (stitches). While the graft material has a granular form when used in this fashion (similar to the consistency of sand), it is retained in the tooth socket by the collagen pledget and sutures until it has the opportunity to begin consolidation.

The Autogenous Ramus/Chin Graft or "Block Bone Graft"

There are times when composite materials such as the aforementioned particulate bone grafts can simply not provide enough bulk or adequately replace the amount of bone that is missing after tooth loss. In these cases, it is sometimes necessary to revert to harvesting the patient's native bone to assist in a "live bone" replacement of the deficient area. There are several possible causes of bone loss that produce defects significant enough to warrant the need for this approach. A few of the most common etiologies include:

- Areas where teeth were extracted without an immediate socket graft, tooth re-implantation or implant.
- An area where a tooth is missing and the nature of the disease associated with the tooth caused extensive bone destruction (i.e., infection, cysts, tumors).
- Areas of the jaw where permanent teeth were congenitally missing and as a result, normal tooth supporting bone failed to develop.
- Bone lost from dental trauma.

In cases such as this, the most commonly used grafting procedure is an autogenous graft (harvested from the patient) and is placed in the form of a block. Hence, we have derived the terminology "autogenous block bone graft." More often than not the block of bone is obtained from the lower jaw in the region where the third molars (wisdom teeth) used to reside. This region is called the mandibular ramus. An alternate site used commonly to obtain a block of bone is the chin. Therefore, you may find in these cases, your surgeon referring to the need for a "chin" or "ramus" graft.

The procedure involves removing a small block of bone (approx. 1 cm square) from either of the two aforementioned sites and transferring that bone to the area of bone deficiency. The graft is then secured with one or two tiny screws and overlaid with particulate bone and a collagen membrane. The surgical site is securely closed and four months is usually given for the graft to fuse to the underlying jawbone before returning to the area to place an implant. Once the graft is mature, the grafted bone

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will not only house an implant in "live" bone but it will also act to support the soft tissue architecture in a manner that is both cosmetically pleasing and hygienically easy to maintain.

The Subantral Graft or "Sinus Lift Procedure"

The maxilla or upper jaw has several qualities that make it unique to grafting as well as the placement of implants. The most significant difference in the maxilla when compared to the mandible lies in the presence of the maxillary sinus. The maxillary sinus is one of the several natural air spaces that are anatomically present in all human skulls. Its biological purpose is to warm, moisturize and filter air when we breathe. While the maxillary sinus is most often only noticed when one has a cold or infection, it can impose itself on the roots of the teeth in the upper jaw.

As a consequence of this relationship, when a tooth is lost, the result may be the presence of very little bone between the oral cavity and this air space. In turn, this can make the placement of an implant in the posterior (back) of the upper jaw a slightly bigger project when in comparison to other areas of the jaw. Fortunately, a relatively simple solution has been developed to handle this problem and render a safe, effective and stable result for placing implants. The subantral graft or "sinus lift procedure" has been performed now for many years to allow implants to be used as a replacement for maxillary molars. While some less experienced implant surgeons (periodontists and restorative dentists) are uncomfortable performing this operation to the extent that it is effective, this is a staple procedure for the oral and maxillofacial surgeon. The patient should not fear that this will have an adverse effect on their sinuses or produce chronic sinus pain. Our experience with this procedure is not generally successful; it's use has been commonplace for many years.

The subantral grafting procedure is performed by making a small window in the sinus above the roots of the maxillary (upper jaw) teeth. The integrity of the membrane lining the sinus is not violated but instead is teased upward to form a small cavity or balloon like space that can be filled with bone graft material. A period of six to nine months is required for this bone to consolidate after having formed a scaffold for natural bone replacement. As this procedure relates to placing implants, there are two possibilities.

Immediate Implant Placement with Subantral Grafting

The ability to place implants at the time of the subantral graft is determined by the amount of native bone present between the sinus and the oral cavity. If less than five millimeters of bone is present and the existing bone in the area is soft, it becomes difficult to primarily stabilize the implants at the time of surgery and insure their stability during the period required for graft consolidation. This can result in either an implant failure or a poorly angulated implant. However, if more than five millimeters of bone is present in the above circumstance, the implants can often be placed at the same time as the graft and the bone allowed to consolidate around the implants during the ensuing months. This obviously has the benefit of eliminating a surgical stage as well as shortening the timeline required to bring the implants into function with teeth. When implants are placed at the time of subantral

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grafting, a consolidation period of usually four to six months is required before the restorative dentist can begin working on building your teeth.

[Delayed Implant Placement with Primary Subantral Grafting](#)

If there is inadequate native bone present at the time of subantral grafting for the placement of implants simultaneously, the graft is typically placed as a lone procedure and the site is allowed to mature for several months. Your surgeon will then return at a second stage, when he has deemed that the time period has been sufficient to place the implants. Since the graft has undergone consolidation at that point, only a standard period of implant integration is required after the second stage before your restorative dentist can begin to reconstruct your implants with teeth.

In summary, it is likely that when considering dental implants for the replacement of missing teeth that you will be asked to consider some form of "grafting" to accompany this process. Dr Cary will discuss with you which of these procedures that he recommends and why. Furthermore, he can answer questions that you may have regarding the peri-operative experience and the post-operative convalescence. All of these procedures are performed very comfortably in an outpatient setting with either local anesthesia or intravenous sedation.