

## WHEN IS SOCKET GRAFTING INDICATED?

As you may have already read, socket grafting is not a fool-proof means of preventing ridge resorption. In some instances, using an implant to 'graft' the socket may lead to better outcomes than socket grafting with bone alone. However, since implants are not the treatment of choice for all edentulous areas, socket grafting is most definitely indicated in the following situations:

1. Sites which will receive fixed partial dentures
2. Sites not suitable for immediate implant placement:
  - a. Molar site / sinus proximity (Fig 1 and 2)
  - b. Large apical infection
  - c. Lack of significant amount of facial or lingual bone
  - d. Young patients where growth is still occurring
  - e. Patients with financial limitations



Fig 1

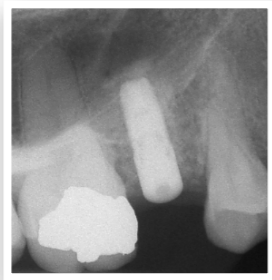


Fig 2

In the case above, the patient could not financially move forward with implant placement immediately. In addition, the sinus proximity would not allow enough osseous support apically for immediate implant placement. Socket grafting maintains ridge dimension for this closed sinus procedure and simultaneous implant placement years after extraction and socket grafting.

\*All cases are patients of Dr. Pamela Nicoara unless otherwise specified.\*

## HEALING AFTER TOOTH EXTRACTION

It is well known that for the average patient, the dimension of the osseous ridge will be reduced after an extraction. The greatest changes in ridge dimension occur within the first 6 months of healing. These changes can range from a reduction in width up to 4.6mm, and a reduction in height up to 3.9mm. The mandible will lose more than the maxilla, and the buccal will resorb more than the lingual.

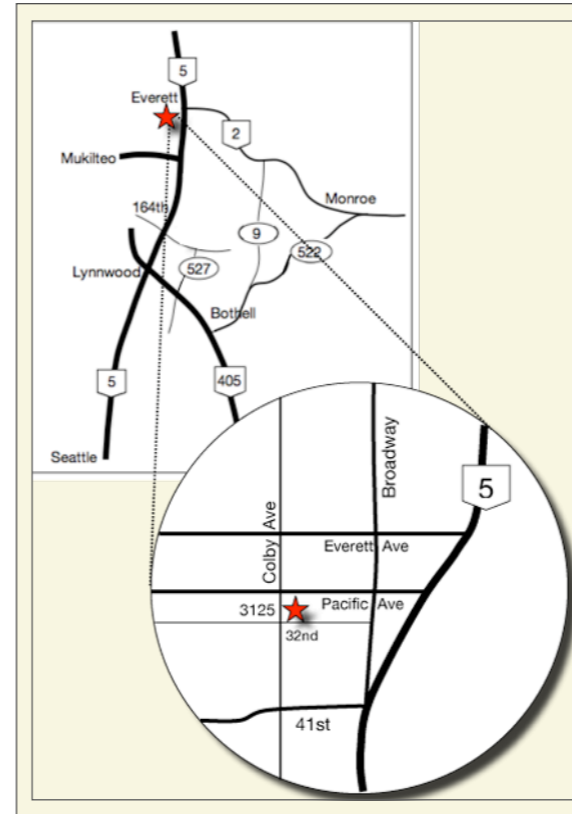
Factors which can affect this amount of resorption are related to the local anatomy of the existing ridge and the anatomy of the tooth to be extracted. Patients with thick buccal exostosis or thick biotype may have less ridge resorption than the average patient, and in addition, because of the relative thickness of the bone, there will be much more residual ridge to work with even with resorption. Regarding tooth anatomy, if roots are curved or there is root fracture or ankylosis, and flap reflection or osseous reduction is required for tooth removal, one can expect increased ridge resorption.

The use of removable partial dentures can mask this loss in volume, but with the increased use of fixed partial dentures and particularly implants, reducing this resorption and maintaining as ideal a ridge width as possible is very important. This is not only true for providing an osseous foundation to support the placement of an endosseous implant, but also to provide ridge dimensions which are hygienic so that collapsed areas of the ridge do not act as food traps around implants or under bridges. This prolongs the life of the implant or adjacent abutment teeth, and also improves esthetics, particularly in the most visible areas when smiling.

This issue of **ProbeTips** will review the types of grafts available, and their effects on the maintenance of ridge dimension, as well as the effects bone grafts have on implant prognosis.

## Pamela A Nicoara DDS MSD PLLC

PERIODONTOLOGY IMPLANTOLOGY ORAL MEDICINE



3125 Colby Avenue, Suite H  
Everett WA 98201  
T: 425-374-5380 F: 425-374-5382

www.NICOARAPERIO.com  
doctor@NICOARAPERIO.com

# PROBE TIPS

A QUARTERLY PERIODONTAL  
NEWSLETTER

BY PAMELA NICOARA DDS MSD

Extraction Socket Grafting



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# The Impact of Extraction Socket Grafting

## GENERAL CONSIDERATIONS

There are many different types of grafts available for ridge augmentation. They range from using autogenous or cadaver tissues, to bioactive glasses. These grafts can be combined with the use of a membrane, as well as with newer materials such as growth factors aimed at increasing the speed and amount of bone fill in the socket. There is difficulty in making comparisons of these materials because of the many different graft materials available, and inconsistent study methodologies. Also, most studies are short term (6 months), and do not provide long term data with regard to maintenance of ridge dimension. The information in the sections that follow are based on systematic reviews that attempt to draw the most accurate conclusions possible by using only the best studies available (randomly controlled, double-blinded clinical trials).

## TYPES OF GRAFTS

The most common types of **bone grafts** are taken from humans, cows, and pigs. Other materials that are used to graft a socket are comprised of glass, coral or calcium. These materials are considered either osteoinductive (because they induce bone formation) or osteoconductive (because they act as a scaffold for bone ingrowth, and do not necessarily induce bone formation). Only human bone, from oneself or from a cadaver, can be osteoinductive. The rest of the materials are osteoconductive.

There are two main types of **membranes**: resorbable and non-resorbable. The theory of using a membrane is to exclude faster moving epithelial cells from migrating into the healing socket area which would reduce bone formation by slower moving osteoblasts. Non-resorbable membranes are the best at achieving this goal, but are difficult

to use because of the technique sensitivity in achieving primary closure, which results in membrane exposure (about 25-30% of the time) ultimately leading to poor wound healing and lack of bone gain over natural socket healing.

**Growth factors** such as Bone Morphogenic Protein (BMP) are osteoinductive and are aimed at increasing the speed and/or amount of bone formation. Most growth factors are either combined with a bone graft material, or are embedded in a carrier such as a collagen sponge. The research is quite variable with regard to outcomes of the use of these materials, with the worst outcomes being equivalent to natural socket healing.

Although it is difficult to conclude that one type of graft performs better than another, of note is to realize that even with the best outcomes, there is still ridge resorption despite the use of a bone augmentation material either on its own, or in combination with a membrane or growth factor. This loss can equal up to 2.6mm in height, and a loss in width of up to 3.5mm (compared to non-grafted controls with losses up to 3.9mm and 4.6mm in height and width respectively).

## DISADVANTAGES OF SOCKET GRAFTING

Although socket grafting will reduce the amount of ridge resorption, it does not completely eliminate bone loss, particularly at the facial aspect of the ridge, which is especially important for anterior esthetic cases. The biggest disadvantage to socket grating would relate to anterior sites where an implant is immediately planned and there are enough bony walls to support implant placement. The section titled 'Alternatives to Socket Grafting' explains this in further detail. The summary of disadvantages includes:

1. Further bone grafting necessary facially after initial healing of grafted socket.

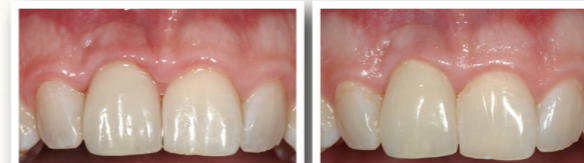
2. Increased healing time on average compared to natural socket healing (6 months vs 3 months)
3. Wasted graft material removed from the implant osteotomy.
4. Altered gingival anatomy (scars or uneven mucogingival junction levels) when primary closure and flap advancement is necessary.

## ALTERNATIVES TO SOCKET GRAFTING FOR IMPLANT SITES

Since socket grafting does not completely prevent ridge resorption, it is important to consider other means of reducing ridge resorption in sites where implants can be placed.

The practice of placing implants into extraction sockets and combining the use of bone graft materials in the gap between the implant and the socket wall reduces resorption. This is particularly true when the gap is greater than 2mm, or the facial plate is less than 2mm thick. This also reduces the number of surgical appointments, reduces treatment time, improves esthetics and improves patient acceptance.

However, even with immediate implant placement and bone grafting of the socket gap, there was bone loss of up to 2mm in both width and height according to systematic reviews. This would be a noticeable dimension change relative to adjacent anterior teeth, as demonstrated here:

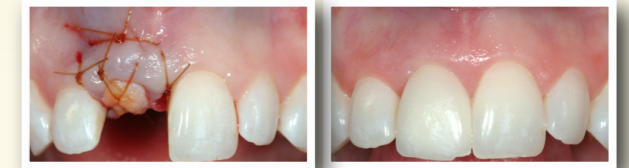


Day of crown seating  
(bone graft only)

10 months later

Because we cannot predict which patients will have which amount of bone resorption, when

anterior esthetics is of chief concern, connective tissue grafting (CTG) is also used to supplement bone grafting in order to provide the most esthetic and dimensionally stable outcome possible. Below is implant placement with bone and CTG, and 9 months after final crown placement.



## IMPACT ON IMPLANT LONG TERM PROGNOSIS?

Darby's systematic review indicates that residual graft particles make up anywhere from 20-75% of the socket. This range depends on the type of graft used and the amount of time allotted for healing. Knowing that residual graft particles may be found 5-10 years after grafting, does this have any effect on the long term prognosis of an implant placed into such an environment? The best answer comes from Chen's systematic review: Implants placed in extraction sockets with bone graft, or into grafted sockets, have a 95% success rate (comparable to survival rates of implants placed into completely native bone.)

## REFERENCES

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\*complete references available on request\*  
All cases are patients of Dr. Pamela Nicoara unless otherwise specified.

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