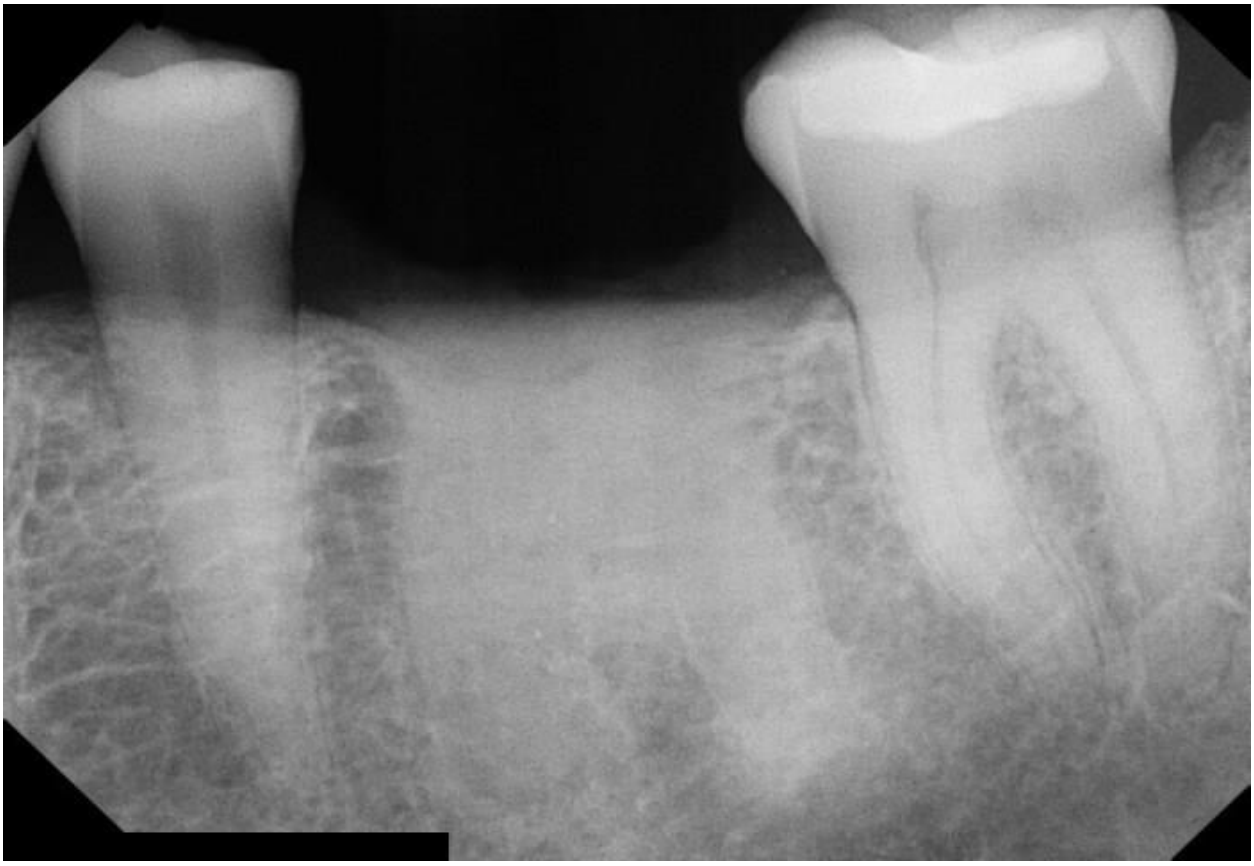
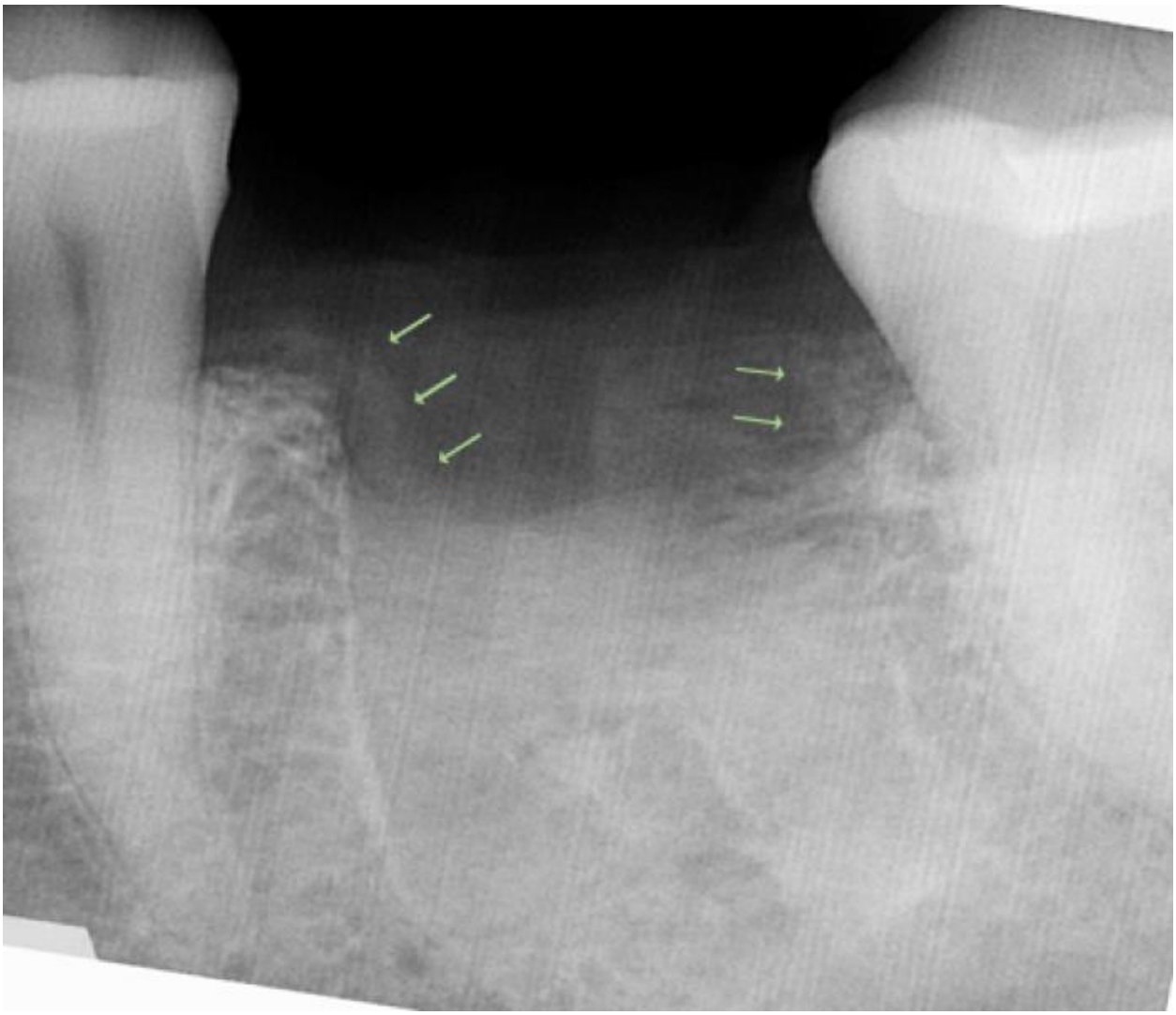
Watching Bone Grow: The Clinical Characteristics of Socket Graft™

This case below describes the process of bone formation during the first month.



This radiograph shows **Socket Graft™** in place the day of extraction covered by a teflon membrane.

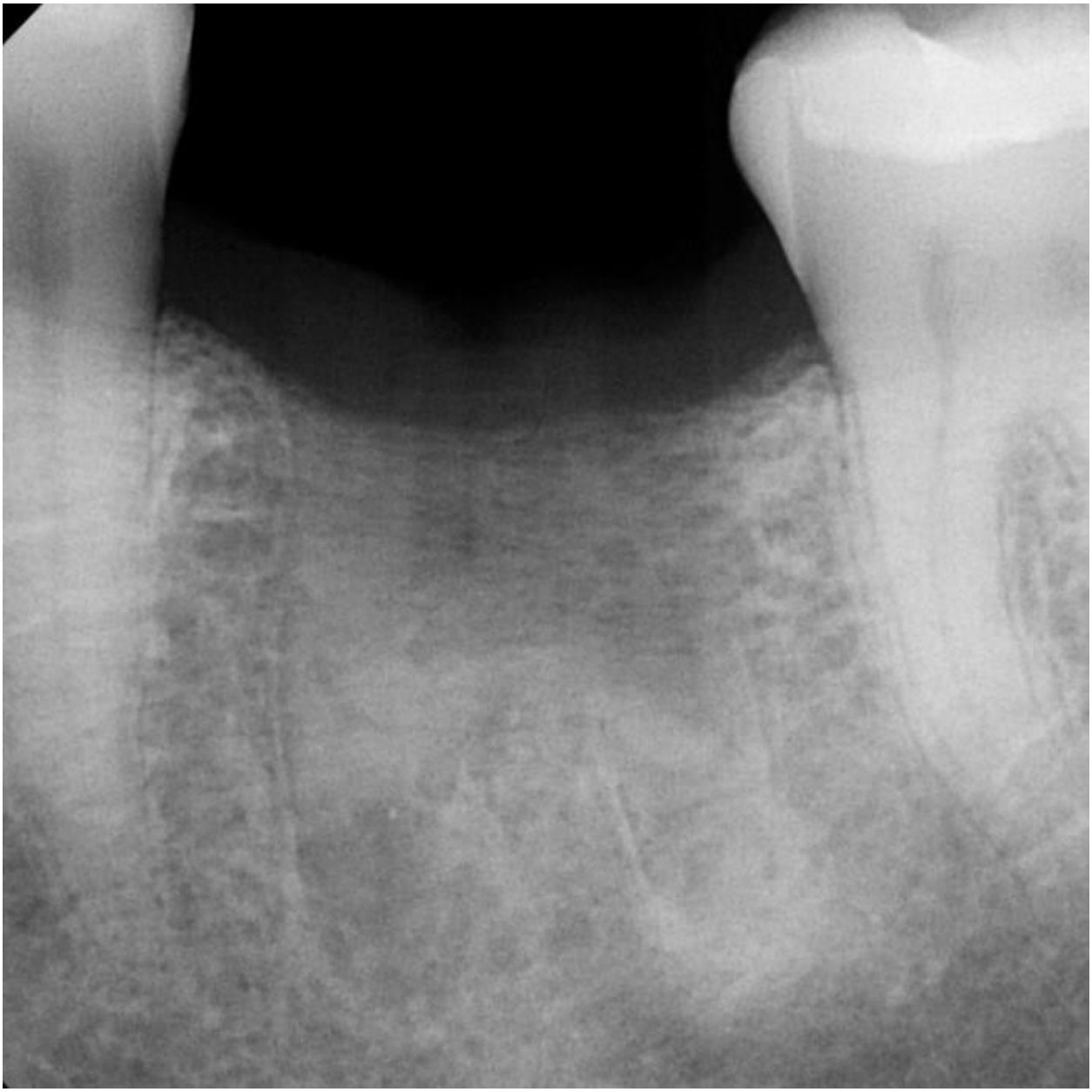
This radiograph was taken at two weeks with normal adult radiation exposure. Socket Graft™ is a dual phase calcium phosphate biocement. The first phase is designed to wash out during the first week to provide porosity for migrating osteoblasts. In this radiograph, the roots are filled with bone. The coronal portion of the socket shows the first phase of the bone graft washed out with no bone formation at this time point.



This radiograph is of the same two-week time period as the previous radiograph, but using a pedo setting to reduce radiation exposure, which allows for better viewing of incipient bone formation and residual graft material.

The radiograph shows the residual graft material in the coronal portion of the socket but also identifies incipient bone formation along the mesial and distal wall of the socket. In socket healing, the majority of bone formation is from the apical portion of the socket. This is due to the body of the mandible containing a far greater amount of regenerative cells which fill the roots first and then grow toward the crest. In this case, however, there is a significant amount of interseptal (interdental) cancellous bone. The width of the interseptal bone plays a crucial role in determining the rate of bone formation at the crest. In instances

where there is narrow interseptal bone there is very little cancellous bone and therefore very few regenerative cells. In cases of minimal interseptal bone, there is often only cortical bone on the buccal and lingual with no regenerative cells, which result in slow mineralization of the socket crest and greater resorption. However, in this case there is a significant width of mesial and distal cancellous bone that contributes to crestal bone formation which can be seen by the arrows.



This is the 4-week radiograph with normal adult radiation exposure. The socket is now filled with mineralized tissue. At this point, the socket is filled with the maximum number of osteoblasts and is theoretically the most ideal time for implant placement for maximum implant integration.

However, it is difficult to surgically delineate the gingiva from the bone at this point. Waiting another month will double the percent of mineralized tissue and produce a crest that can be surgically identified. Most dentists think that high torque and hard bone is the best for implant integration, but this is completely wrong. The mineralized portion of bone contains no osteoblasts and therefore provides for no implant integration. Osteoblasts only reside in the soft tissue stroma and provide no resistance to torque. The more osteoblasts the better the integration.

When using bone graft materials that produces normal, healthy, vital bone, early implant placement ensures a high level of implant integration. Because of an ideal anatomy with good mesial and distal cancellous bone, all socket walls present and a rapidly resorbed graft material that stimulates osteogenesis this patient is ready for implant placement 2 months after extraction.

At the 4 week time period, if the site was not grafted, the socket would be filled with dense collagen and very little bone. When a tooth is extracted and not grafted, it goes through a cycle of clot, granulation tissue, and then collagen before any bone is formed, which takes a month. With Socket Graft™, the clot- granulation tissue-collagen plug is skipped and bone formation begins immediately. With Socket Graft™, bone formation is accelerated by SL Factor and elemental calcium phosphate. Calcium phosphate in its elemental state is known to stimulate bone formation and Socket Graft™ is the only bone graft on the market that contains calcium phosphate in elemental form which contributes to the bone formation shown on these radiographs. Ceramic bone grafts that contain calcium phosphate do not stimulate bone formation because the particles must be encased in bone before osteoclasts can release the calcium phosphate during resorption and therefore it is too late in the process to stimulate bone formation.

Any particulate synthetic bone graft material will proceed through the same process of clot, granulation tissue, and collagen plug during the first month, followed by osteoconduction—just like a socket without graft. The presence of biocompatible but biologically inert granules produces the same amount of bone at the same rate but it will maintain volume due to the presence of the granules.

When using cadaver bone grafts, there is no way to know if bone has formed radiographically. The process of bone formation for cadaver bone grafts is different than normal bone formation as it takes place on the graft particles and not from the surrounding bone. At 4 weeks, no bone formation will have occurred in a socket grafted with a cadaver bone graft.