Treatment of Osseous Defects Using Vicryl Mesh (Polyglactin 910) and the Brånemark Implant: A Case Report

Thomas J. Balshi, DDS*/Ramon E. Hernandez, OD*/Richard H. Cutler, DMD*/
Charles F. Hertzog, DMD*

The effectiveness of using Vicryl mesh (polyglactin 910) in combination with a Brånemark titanium implant is described. A maxillary central incisor with an apical osseous defect resulting from endodontic failure was treated with the Brånemark method of osseointegration for single tooth replacement. Vicryl mesh was used over the osseous defect site and uncovered 5 months later. New bone formation filling the defect and around the implant was observed.

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Key words: bone formation, Brånemark implant, osseointegration, osseous defect, Vicryl mesh

The concept of osseointegration, introduced by Brånemark in the early 1960s, was described as the result of direct contact between living bone and pure titanium implants without interposed soft-tissue layers.[1,2] This concept was supported by animal studies in which titanium chambers were incorporated within the healthy, living bone tissue.[3] It was reasonable to assume that bone anchorage according to the principle of osseointegration might also work in humans, and the first dental patient was treated in 1965.[1] Since then, the osseointegration procedure ad modem Brånemark has been successfully used in healthy bone for the treatment of complete edentulism,[4] partial edentulism,[5-7] and, more recently, single tooth replacement.[7,8]

The loss of a single tooth may create functional, esthetic, and emotional problems for a patient. Traditional prosthodontic treatment, such as cast crowns using the adjacent abutment teeth for support, may not be the most biologically conservative form of treatment. For some patients, the use of a single implant supporting a prosthetic tooth therefore becomes an alternative treatment consideration.[8]

*Institute for Facial Esthetics, 467 Pennsylvania Avenue, Fort Washington, Pennsylvania 19034.

Increasing the amount of bone tissue using autogenous grafts in combination with titanium implants for treatment of patients with insufficient mandibular ridges has been described by Laney and Tolman,[9] and more recently for treatment of the maxilla by Kahnberg et al.[10]

A membrane technique based on the principle of guided tissue regeneration has been used in humans.[11] Its success in regenerating the attachment apparatus in teeth with advanced loss of periodontal tissue is well documented. According to this technique, cells from the periodontal ligament will populate the surgical site, producing regeneration with the desired tissue type. Experimental studies using a polytetrafluoroethylene membrane (Gore-Tex, WL Gore, Flagstaff, Arizona) in combination with pure titanium implants in rabbits showed that a complete selective formation of bone can be accomplished without the interposition of soft tissue.[12] Similar results with the same membrane have been reported more recently in humans.[13]

Other studies in humans using an absorbable polyglactin 910 mesh membrane (Vicryl) and osseous grafting have been carried out by Schultz and Gager.[14] Following the guided tissue regeneration technique, these studies show how Vicryl mesh is used in combination with osseous grafting to obtain new bone tissue formation over the surgical site.

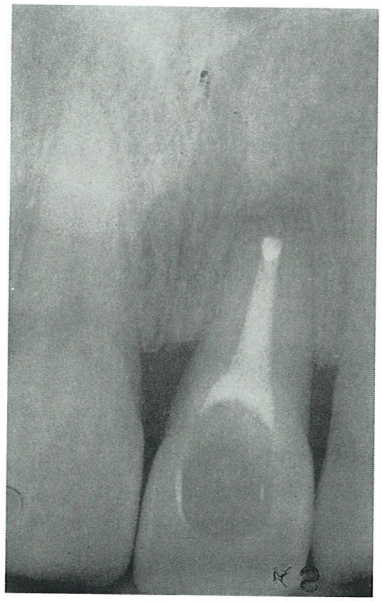


Fig 1a *(Left)* Preoperative radiograph of an endodontically failing maxillary right central incisor. Advanced mobility, shortened root following apical surgery, and chronic discomfort contribute to the diagnosis.

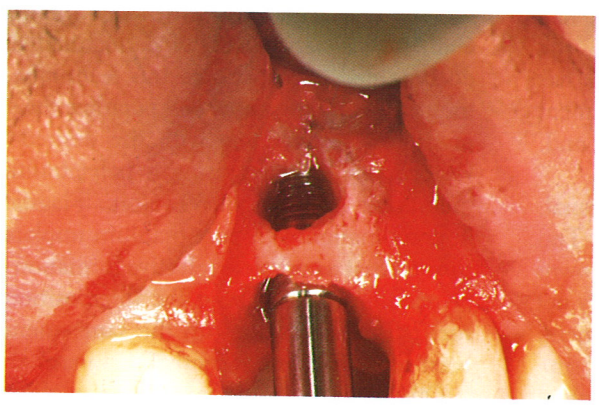
Fig 1b *(Above)* Long bevel from apex toward the cementoenamel junction left only 2 to 3 mm of cementum in contact with the periodontal ligament and labial bone.

There are three distinct advantages of using Vicryl mesh: *(1)* because it is an absorbable material, a second procedure to remove the mesh is not required; *(2)* it exhibits no antigenic or pyrogenic effects; and *(3)* it is cost-effective to use.

Use of the Brånemark System® (Nobelpharma AB, Göteborg, Sweden) with the placement of allograft material to induce new bone generation in humans has not been widely reported. This paper describes the use of Brånemark titanium implants in combination with Vicryl woven mesh (Johnson & Johnson Dental Care Division, New Brunswick, New Jersey) as a barrier to soft-tissue ingrowth, promoting bone formation in areas of osseous defects.

Patient Report

A 30-year-old male who suffered traumatic injury and discoloration of the crown of the maxillary left central incisor at age 14 was treated with conventional endodontics followed by bleaching therapy. Three years later, the patient complained of pain of the apical area. Inflammatory resorption was the diagnosis. An apicoectomy with retrosurgical filling was performed. At



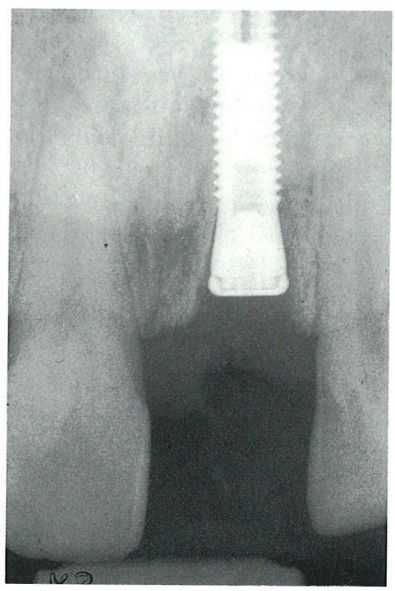


Fig 2a *(Above)* Placement of a 15-mm Brånemark self-tapping conical implant. Threads are clearly visible in the labial bone defect.

Fig 2b *(Right)* Postoperative radiograph immediately following fixture placement. Apical threads of fixture engage bone beyond the area of the osseous defect.

a re-evaluation 4 years later, a second apicoectomy was necessary to obtain better osseous healing and terminate root resorption.

The recent medical history reveals the patient to be in excellent general health with no known allergies or sensitivities to medications. The tooth in question was evaluated clinically and radiographically. It had a 2½ mobility (based on a scale of 0 to 3, with 3 being "hopeless"). The possibility of an immediate Brånemark implant placement into the extraction site was considered as a method of avoiding residual ridge collapse and the future need for a conventional fixed prosthesis.

A surgical guidestent was fabricated preoperatively.[15] Local anesthesia was used for extraction of the tooth (Figs 1a and 1b) with minimal trauma to the surrounding bone, preserving the integrity of the alveolar walls—especially the crestal labial plate (Fig 2a). Using curets, the socket was thoroughly degranulated. When the mucoperiosteal flap was reflected, a 6-mm-diameter osseous defect (fenestration) was found on the facial plate as a consequence of the external inflammatory resorption and unhealed access of the apicoectomies. A 15-mm self-tapping conical Brånemark implant was placed with minimal trauma using the prescribed Brånemark surgical methods (Fig 2b). Maximum stability of the implant was obtained by engaging bone beyond the apex of the socket and apicoectomy defect. Vicryl mesh was selected as a barrier material because of its assumed ability to prohibit epithelium and gingival connective tissue growth and permit regeneration of bone tissue in the defect site.[16]

The Vicryl material was carefully cut and placed over the labial surface of the implant and its surrounding osseous defect with margins 5 mm subperiosteally beyond the fenestration (Figs 3a and 3b). The flap was repositioned, and Vicryl sutures were used to securely stabilize the flap and barrier material in place (Fig 4). An immediate postoperative radiograph of the surgical site was made (Fig 2b). Antibiotics were prescribed immediately prior to the surgery as well as postoperatively

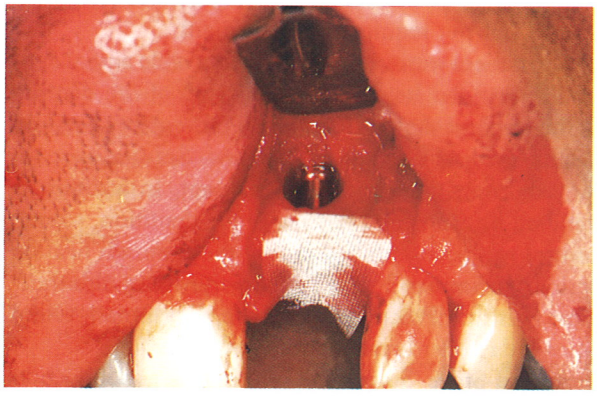


Fig 3a Vicryl mesh (polyglactin 910) covers the osseous defect. The coronal area may be stabilized by placing the titanium cover screw through the fabric.

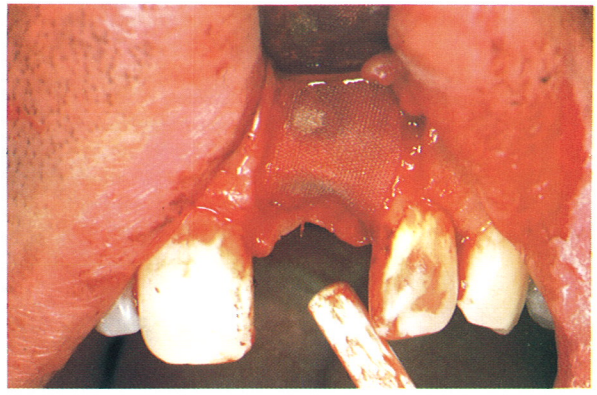


Fig 3b Margins of the Vicryl mesh must extend 5 mm or more beyond the osseous defect and be placed under the periosteum, to which it is securely sutured.

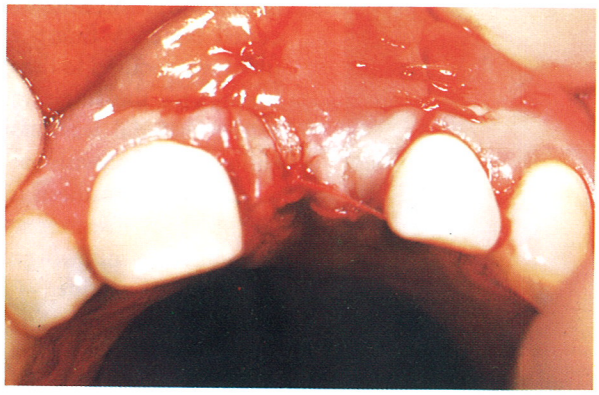


Fig 4 Flap closure is completed with Vicryl sutures. The prosthesis is relieved in the area of surgical treatment.

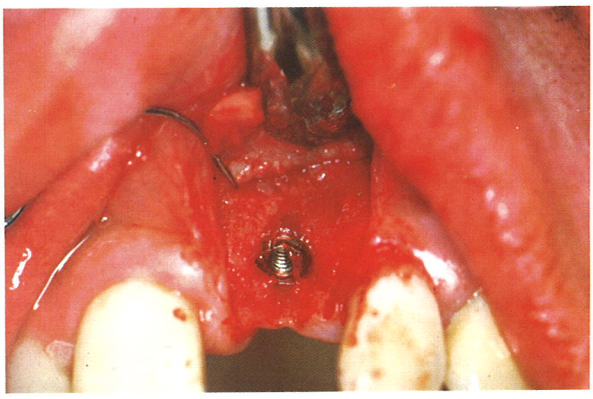


Fig 5 *(Above)* Five months posthealing, labial flap reveals complete osseous fill of the defect.

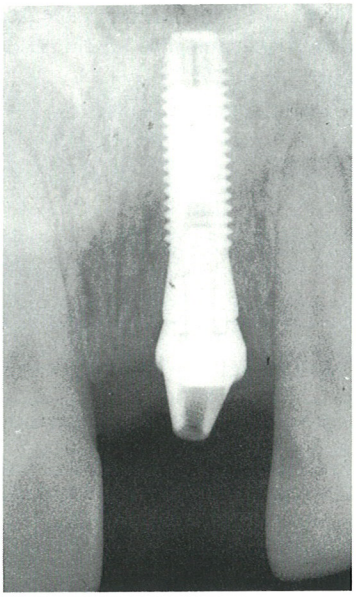


Fig 6 *(Right)* Postoperative radiograph following 5-month healing period shows good bone adaptation to the Brånemark implant.

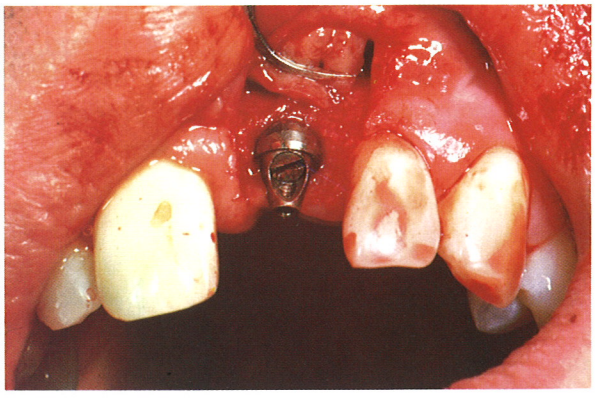


Fig 7 Placement of a Brånemark angulated abutment compensates for fixture placement following the long axis of the extracted root.

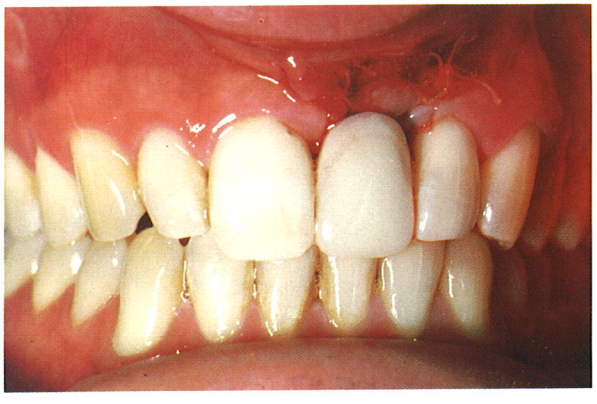


Fig 8 The patient can comfortably function with a conversion prosthesis until complete soft-tissue healing occurs, at which time the final porcelain-fused-to-gold prosthesis is fabricated.

(penicillin V potassium [Pen Vee K], 250 mg, 1 qid for 10 days). Medication for analgesia was also prescribed but not required by the patient.

The patient wore a provisional removable partial denture during the healing period. Relief of the denture in the implant site was required to prevent any pressure on the residual ridge or cover screw. Sutures were removed 7 days after implant placement. In addition to standard brushing and flossing of the dentition, plaque control was accomplished during the 5-month healing period (beginning 2 days postsurgery) using chlorhexidine (Peridex, Procter and Gamble, Cincinnati, Ohio) twice a day after breakfast and before bedtime.

Second-Stage Surgery. The abutment connection surgery was performed 5 months after implant placement. A mucoperiosteal flap was reflected to observe the area of osseous defect. Complete bone healing was noted around the surgical site filling the osseous defect (Figs 5 and 6). No signs of inflammatory reactions were seen around the implant or in the area of the regenerated bone. A Brånemark titanium angulated abutment was secured to the implant to provide appropriate support for the single tooth prosthesis (Fig 7). Vicryl suture material was used to secure the flap. Modification of the provisional removable partial denture to a conversion prosthesis immediately followed (Fig 8).[17] Oral hygiene instructions included the appropriate use of dental floss following incision healing and continued use of chlorhexidine.

Discussion

Bone repair will not begin until local circulation has been re-established. Bone cells must be in a healthy

condition. The healing process of the necrotic zone around an implant and osseous defect will depend on one particular type of coupled osteoclast/osteoblast action and adequate bone growth stimulated by surgical trauma.[18]

Using the membrane barrier technique to obtain both, osseointegration and new bone formation have been demonstrated in this patient situation. Vicryl mesh apparently was a factor in preventing connective tissue from proliferative ingrowth at the osseous defect, allowing bone tissue exclusively to occupy the area.

The combined use of a Brånemark titanium implant and Vicryl mesh offers new opportunities for the treatment of patients with compromised bone support at the implant site. Vicryl could be an ideal material for this treatment, since it has excellent biocompatibility and is absorbed, therefore eliminating the need for a reopening surgical procedure. Other factors for a successful result include the quality and quantity of the remaining alveolar crest, minimal surgical trauma, and precise prosthodontic reconstruction.

Summary

Treatment with Vicryl mesh and Brånemark implants requires further evaluation to determine its feasibility for routine use. This combined procedure does provide for controlled new bone formation in areas of osseous defect, and it appears to be safe and efficacious. □

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Résumé
Utilisation d'une membrane de Vicryl sur un défaut osseux intéressant un implant Brånemark: Rapport d'un cas

L'efficacité de l'emploi d'une membrane de Vicryl (Polyglactin 910) est décrite en combinaison avec un implant Brånemark en titane. Une incisive centrale maxillaire présentant un défaut osseux résultant d'un échec endodontique fut restorée à l'aide d'un implant unitaire. Une membrane de Vicryl fut appliquée sur le défaut osseux et exposée cinq mois plus tard. Une formation de tissu neo- osseux contre l'implant et comblant le défaut fut observée.

Zusammenfassung
Wirkung auf Knochendefekte, wenn man Vicryl-Masche und das Brånemark-Implantat verwendet: Eine Fallmitteilung

Die Wirksamkeit vom Gebrauch von Vicryl-Masche (Polyglactin 910) in Kombination mit einem Brånemark-Titanimplantat wird beschrieben. Ein maxillärer mittlerer Schneidezahn mit einem apikalen Knochendefekt, der aus endodontischem Versagen resultierte, wurde mit der Brånemark-Osseointegrationsmethode zum Einzelzahnersatz behandelt. Vicryl-Masche wurde über die Stelle des Knochendefektes gelegt; die Masche wurde 5 Monate später entfernt. Neue Knochenbildung, die den Defekt ausfüllte und in der Umgebung des Implantates lag, wurde beobachtet.

Resumen
Reporte de caso sobre los efectos del uso de la malla Vicryl y del implante Brånemark sobre los defectos oseos

Se describe la eficacia del uso de la malla Vicryl (Polyglactin 910) en combinación con un implante de titanio tipo Brånemark. El método de oseointegración Brånemark fue utilizado para el reemplazo de un incisivo central superior que tenia un defecto óseo apical, consecutivo a un tratamiento de endodoncia que falló. Una malla de Vicryl fue utilizada sobre el defecto óseo, el cual fue descubierto 5 meses mas tarde. Se observó que el defecto estaba relleno de nuevo hueso, lo mismo que el área alrededor del implante.