

An Innovative Surgical Technique That Employs A Modified Subperiosteal Implant To Reconstruct Missing Cranial Bone Caused By Physical Trauma

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ABSTRACT

Maxillofacial surgery offers several techniques to restore bone lost in the face due to trauma, including bone grafting and acrylic implant procedures. Recently, a modified prosthesis (Problast) has been developed as a new surgical option to restore missing nonfunctional Frontal bones of the Skull above the frontal sinus.

Keywords: Maxillofacial, Trauma, Problast, Prosthesis, Frontal sinus.

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INTRODUCTION

The Problast implant is mainly designed for cosmetic restoration¹. It has a high level of porosity, ranging from 70-90% by volume, and is lightweight with low crushing strength. It can be resorbed when subjected to direct trauma. The implant is supplied in a sheath form, which can be trimmed to the required size and shape, and then autoclaved².

MATERIALS AND METHOD

The Problast implant is carefully immersed in a specialized solution composed of biocompatible phosphate and oily calcium suspension, which helps to promote osteo-conduction³. Additionally, porous Hydroxyl apatite is integrated into the solution to further encourage the growth of fibrous tissue and bone formation through the implant's porous surface. To optimize this process, a biocompatible material is delicately injected into the Problast sheath using a syringe, fostering even greater growth of fibrous tissue and bone within the implant's porous structure⁴.

Clinical Examination

Normal vital signs are present in all patients. However, seven patients exhibit a missing part of the Frontal bone. Additionally, a single patient presents a depressed comminuted fracture of the Frontal bone above the Frontal sinus⁵.

Surgical Procedure

During the surgical procedure, an external approach was utilized with oro-endotracheal intubation. A parallel incision was made along the skin crest line at the defective area, cutting through the scar tissue. Dissection exposed the bones surrounding the defect, and the periosteum was reflected and undermined using a periosteal elevator⁶. If the fracture was comminuted, all comminuted bones were removed⁷. The Problast implant sheath was trimmed to fit the required size and shape to restore the contour of the missing bone. After autoclaving the implant in the operation theatre, it was introduced under the periosteal (sub-periosteal) to contour the defective area without the need for fixation to the surrounding bones, unlike the bone graft or acrylic implant technique which require fixation, this ensured that the implant would not move or migrate, preventing failure of the graft⁸. The Problast implant was placed in the scar bed (recipient area) and did not require a rich blood supply bed like a bone graft. Fibrous tissues grew into the porosities of the sub-periosteal implant, providing temporary fixation. The wound was sutured in layers without tension to avoid resorbing the implant by pressure⁹.

Post-Operative Care

To ensure proper healing, patients should avoid sleeping on the side that was operated on for eight weeks¹⁰. Additionally, prophylactic antibiotics, sedation, and analgesics are not necessary¹¹.

CONCLUSION

As the weeks progress, bone spicules will grow through the implant's porosities, resulting in permanent fixation of the Problast implant. Depending on the extent of bone loss, it can take up to five years for the Problast to be fully replaced by bone. This innovative surgical technique is less invasive and time-consuming than traditional bone graft surgery, making it an excellent option for patients who are not candidates for the latter. Furthermore, only three patients required scar revision, and the implant provides a lasting and natural-looking restoration of the affected area.

Follow Up Studies

Following five years of clinical monitoring and X-ray examinations, it was discovered that the sub-periosteal implant had been fully substituted by healthy bone. The bone had undergone remodeling, leading to a pleasing visual outcome in the previously impacted region. Notably, no setbacks or complications were documented during this period. Nonetheless, additional monitoring and research are suggested.

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