Biomimetic Cranial Reconstruction

Your Optimal Regenerative Solution
Cranial Reconstruction

Today, the reconstruction of large and complex cranial defects is no longer considered simply a matter of the aesthetics. Neurological and psychological side effects must also be taken into account.

Through use of an advanced and bio-mimetic ceramic material, CustomBone Service provides a proven solution for bone replacement.
CustomBone Service: The Process

From the CT Scan to the Customized Implant

Acquisition and Elaboration of the CT Scan

CustomBone Service starts from the raw digital data obtained during the CT scan, and through extensive computer elaboration, allows the creation of an individualized 3D computer reproduction of the patient’s skull.

A detailed protocol providing all the necessary parameters for correct 3D data acquisition is provided through the CustomBone Service web portal.
3D Model
Direct Discussion with the Surgeon

Together with “Finceramica’s team”, the surgeon has the opportunity to discuss and review the patient specific device design through CustomBone Services’s web portal ordering platform. This is a crucial phase in order to provide an individually tailored designed implant for patient.

From Design to Realization

Once the design has been approved by the surgeon, the high tech manufacturing process starts, leading to a highly crystalline hydroxyapatite prosthesis. Implants are supplied sterile, ready for surgery.
In modern medical science, the concept and application of bio-mimetic materials has been consolidated and incorporated into everyday clinical practice. These bio-mimetic materials are defined as synthetic materials with a chemical composition and structure that resembles the mineral component of human bones.

For CustomBone Service, the research team at Finceramica has transferred this concept into reality through the development of a bio-mimetic ceramic biomaterial based on macro and micro porous hydroxyapatite, a major (70%) component of human bone\(^1,2\).

Specific bio-mimetic chemical composition combined with an elevated interconnected porosity play a role in the perimetral osteointegration process.

In particular CustomBone’s interconnected macro-pores are suitable for housing cells responsible for bone regeneration\(^3,4\). Based on CT studies, the implants demonstrate perimetral osteointegration\(^5-9\).

Manufacturing process featured by a high temperature sintering process, enhances highly crystalline non absorbable ceramic hydroxyapatite (HA).

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The Unique Properties of Bio-Mimetic Ceramic Material

- biomimetic macro- and micro-porosity
- interconnected macro-pores are suitable for housing cells responsible for bone regeneration
- highly bio-compatible material, showing a reduced post-op infection incidence compared to titanium-based implants (*
- the porous structure and hydrophilic surface allow for loco-regional use of antibiotics, when deemed clinically useful by the surgeon (**, ***)
- natural aesthetic result leading to high level of patient satisfaction
- completely radiolucent allowing for MRI diagnostics without artifacts

Limitations of Other Cranioplasty Materials

Autologous bone:
- conservation procedures are complex
- limited material quantity which may not be sufficient for large and complex defects
- donor site morbidity
- potentially reabsorbed, especially in certain patient groups

Titanium and acrylic resins:
- not biomimetic materials
- not osteoconductive
- artifacts during diagnostic MRI


CustomBone Service: The Process
Indications

CustomBone Service is intended to replace bony voids in the cranial and/or craniomaxillary skeleton. This device may be used both for adult and pediatric patients (for children above 2 years of age). CustomBone Service implants are suitable for reconstruction of cranial defects resulting from:

- trauma and vascular pathologies, either associated or non-associated to cranial decompression;
- removal of tumors;
- reabsorption of autologous bone;
- rejection of other prothetic materials;
- congenital malformations.

Trauma

Patient presented a serious cranial trauma due to a car accident. A bilateral frontal decompression was performed and then, in a second operation, the cranioplasty was performed with CustomBone.

Absorption of Autologous Bone Graft

Seventeen-year-old patient presented absorption of the autologous bone graft after a craniotomy. The defect area was removed and the CustomBone prosthesis implanted in a single operation.
Tumor Resection

Demolition and resection of an atypical meningioma relapse at the forehead was performed on a 45-year-old female patient. Cranial reconstruction with CustomBone implant was performed with one step procedure in combination with neuronavigational system.

* Topics in Medicine 2010; Special Issue 1-4.

Second Line Treatment Following Other Material Rejection

Patient underwent cranial decompression after trauma, reconstruction of the area was performed with a resin implant. An infection occurred and material was rejected. Final reconstruction was successfully performed using a CustomBone Service implant.
