



COMMENTARY

Open Access

Simulation and Clinical Use of Surgical Bone Segment Navigation

Han Wanlei*

Department of Orthopaedic Surgery, Hunan University, Hunan, China

ARTICLE HISTORY

Received: 20-Feb-2023, Manuscript No. EJMACES-23-93267;

Editor assigned: 22-Feb-2023, PreQC No. EJMACES-23-93267 (PQ); **Reviewed:** 10-Mar-2023, QC No. EJMACES-23-93267;

Revised: 17-Mar-2023, Manuscript No. EJMACES-23-93267 (R);

Published: 24-Mar-2023

Description

Bone segment navigation is a surgical technique used in craniofacial surgery to position artificially generated bone fragments or to determine the anatomical position of displaced bone fragments in fractures. By osteosynthesis, such fragments are later cemented in place. It was created for use in oral and maxillofacial surgery as well as craniofacial surgery.

A fracture can develop following an incident or injury, and the ensuing skeletal fragments can be moved. In the oral and maxillofacial region, such a displacement could have a significant impact on facial appearance and organ function. For example, a fracture in the bone that defines the orbit can cause diplopia, a fracture of the mandible can significantly alter dental occlusion, and a fracture of the skull (neurocranium) can result in an increase in intracranial pressure. In order to construct a more normal-looking face in cases of severe congenital abnormalities of the facial skeleton, surgical fabrication of often multiple bone segments is necessary.

Surgical planning and surgical simulation

Osteotomies are surgical procedures that include cutting through bone and repositioning the fragments in their proper anatomical locations. The intervention can be planned in advance and simulated to ensure the best possible repositioning of the bony components by osteotomy. The actual operating time might be cut in half with the help of surgical simulation. The presence of soft tissues, such as muscles, fat, and skin, frequently limits the surgical access to the bone segments during this type of operation, making it highly challenging or even impossible to determine the precise anatomical displacement. On models of the naked skeletal structures, preoperative planning and simulation can be carried out. Alternately, the process

might be planned fully using a model created by a CT scan and the movement specifications could be output quantitatively.

Materials and devices needed for preoperative planning and simulation

Orthognathic surgery osteotomies are traditionally planned using cast models of the tooth-bearing jaws that are fixed in an articulator. Stereolithographic models may be used in the surgical planning process for edentulous patients. Following an incision along the intended osteotomy line, these tridimensional models are slipped into place, and finally fixed. Modern presurgical planning methods have been developed since the 1990s, enabling the surgeon to plan and simulate the osteotomy in a virtual setting based on a preoperative CT or MRI. This procedure cuts down on the time and cost associated with creating, positioning, cutting, repositioning, and refixing the cast models for each patient.

Clinical use of bone segment navigation

In 1997, Watzinger, published the first clinical report on the application of this kind of system for the repositioning of zygoma fractures utilising a mirrored image from the normal side as a target. Marmulla and Niederdelmann reported using the method in 1998 to monitor zygoma fracture repositioning and the position of the LeFort I osteotomy. Using the technique to monitor multisegment midface osteotomies in severe craniofacial deformities was first reported by Cutting in 1998. No matter how accurate the preoperative planning is, its value is dependent on how accurately the simulated osteotomy is replicated in the operating room. The surgeon's visual abilities were mostly used to convey the planning. To mechanically guide bone fragment repositioning, various guiding headframes were created.

Contact: Han Wanlei, E-mail: Hanwanlei46@gamil.com

Copyright: © 2023 The Authors. This is an open access article under the terms of the Creative Commons Attribution NonCommercial ShareAlike 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>).

During CT or MRI scans as well as surgery, a headframe like this is fastened to the patient's head. Utilizing this equipment presents several challenges. First, both during CT or MRI registration and during surgery, it is necessary for the headframe position on the patient's head to be precisely reproducible.