



Contents lists available at ScienceDirect

## Journal of Cranio-Maxillo-Facial Surgery

journal homepage: [www.jcmfs.com](http://www.jcmfs.com)

## Use of cutting guides during craniosynostosis sequelae surgery: A comparative study between computer-assisted planning and post-operative results

Chrystelle Queiros<sup>a, d, \*</sup>, Aline Joly<sup>a, d</sup>, Arnaud Paré<sup>a, d</sup>, Antoine Listrat<sup>b, c</sup>,  
Nadine Travers<sup>b, c</sup>, Dominique Goga<sup>a, d</sup>, Boris Laure<sup>a, c, d</sup>

<sup>a</sup> Department of Maxillofacial Surgery, Centre Hospitalier Universitaire de Tours, France

<sup>b</sup> Department of Pediatric Neurosurgery, Centre Hospitalier Universitaire de Tours, France

<sup>c</sup> Department of Craniofacial Surgery, Clocheville Hospital, Centre Hospitalier Universitaire de Tours, France

<sup>d</sup> Université de Médecine François Rabelais, Tours, France

## ARTICLE INFO

## Article history:

Paper received 3 February 2017

Accepted 20 March 2017

Available online xxx

## Keywords:

Craniosynostosis surgery sequelae

Craniofacial surgery

Cutting guides

Anterior plagiocephaly

Trigonocephaly

Adolescent

## ABSTRACT

**Background:** The authors compared results of craniofacial reconstruction surgery using cutting guides with planned reconstruction on patients presenting craniosynostosis surgery sequelae.

**Methods:** This is a retrospective study performed on seven patients who had undergone craniofacial reconstructive surgery in University Hospital Center of Tours (France) in 2015. Patients had long-term sequelae of trigonocephaly and anterior plagiocephaly surgery. 3D computer model was constructed, based on CT scans and used for surgical planning. Cutting guides were realized to use patient autologous bone. Post-operative 3D cranioplasty was superimposed to the 3D pre-operative to determine the minimal distance between each point of the post-operative flap and its pre-operative point corresponding.

**Results:** Mean of minimal distances calculated per patient ranged from 0.89 mm to 1.85 mm. The best result for percentage of points having the minimal distance inferior to 1.8 mm was 98.2 percent; the worst result was 55 percent. This value ranged from 77.5 to 98.2 percent for trigonocephaly cases. This value ranged from 55 to 77.5 percent for plagiocephaly cases. No significant difference was found between pre and post-operative areas and volumes of each flap,  $p = 0.12$  and  $p = 0.19$  respectively.

**Conclusion:** Using cutting guides facilitates complex craniofacial reconstructions with patient autologous bone and obtains precise and reproducible results.

© 2017 European Association for Cranio-Maxillo-Facial Surgery. Published by Elsevier Ltd. All rights reserved.

### 1. Introduction

Craniosynostosis sequelae surgery is not well documented. There are some studies evaluating long-term results of craniosynostosis surgery done during childhood for anterior plagiocephaly (Anderson and David, 2005; Selber et al., 2008; Zakhary et al., 2014; Taylor et al., 2015) and trigonocephaly (Cohen et al., 1994; Engel et al., 2012; Wes et al., 2014). Overall, these studies show satisfying results; however, for patients with sequelae such as unaesthetic bone irregularities, frontal orbital defects or re-ossification

defects (Zakhary et al., 2014; Noordzij et al., 2016; Joly et al., 2016), a second surgery is not regularly performed, and, when needed, the surgical techniques are not well described.

Nowadays, several biomaterials exist to fill a bone defect in the skull or to use in a cranioplasty (Neumann and Kevenhoerster, 2009). Nevertheless, patients with craniosynostosis sequelae are children or teenagers who have already undergone surgery. It seems more appropriate to perform cranioplasties with autologous bone to limit the presence of exogenous material. These cranioplasties can be complex and therefore benefit from three-dimensional (3D) surgical planning that allows the realization of customized, patient-specific cranial bone grafts.

Computer-assisted surgery, including the design of patient-specific cutting and positioning guides, is developing more and

\* Corresponding author. Centre Hospitalier Universitaire de Tours, Service de chirurgie maxillo-faciale, 2, boulevard Tonnellé, 37044 Tours cedex 9, France.

E-mail address: [chrystelle.queiros@etu.univ-tours.fr](mailto:chrystelle.queiros@etu.univ-tours.fr) (C. Queiros).

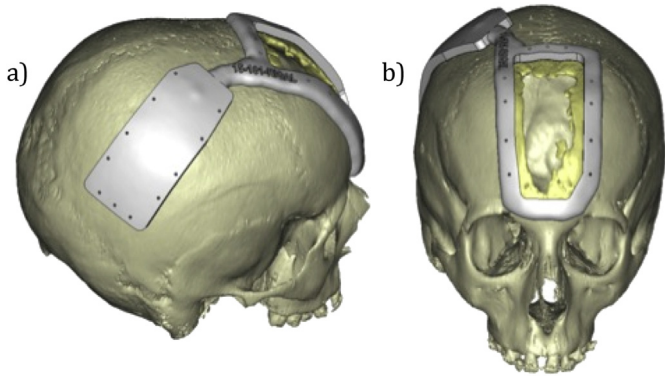


Fig. 1. Positioning of the cutting guide. a) Pre-drilling. b) Bone resection.

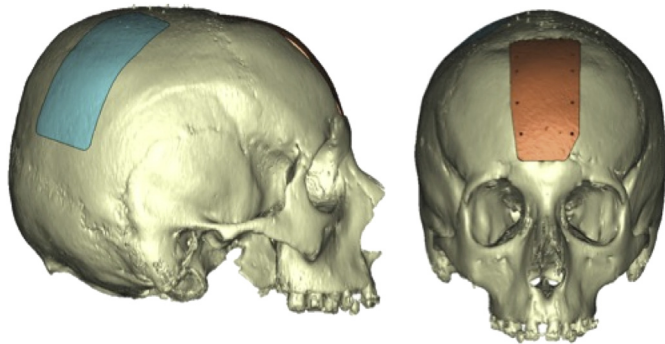


Fig. 2. Graft repositioning.

more in craniofacial and maxillofacial surgery. These techniques are often used for free flap reconstruction of the mandible, zygomatic bone osteotomies, porous titanium implant placement, or in craniosynostosis cases during the first surgery (Mardini and Wetjen, 2014). It enables a better correction of asymmetries and craniofacial malformations. A preoperative computed tomography (CT) scan of the patient is used to construct a 3D computer model of the patient's skull. This model is then used for preparation of the surgery and makes it possible to plan the reconstruction in a more precise, predictive, objective way (Bly et al., 2013; Hierl et al., 2013;

Seruya et al., 2013; Chim and Mardini, 2014). There are, however, few comparative studies in maxillofacial and craniofacial surgery between preoperative computer-assisted planning and post-operative results.

The objective of this study was to perform a comparative analysis between the planning of the reconstruction using specific software and post-operative results for patients who have undergone a surgery for craniosynostosis sequelae. The main evaluation criterion was the minimum distance between reference points on the 3D bone model in the post-operative model and the model used for planning.

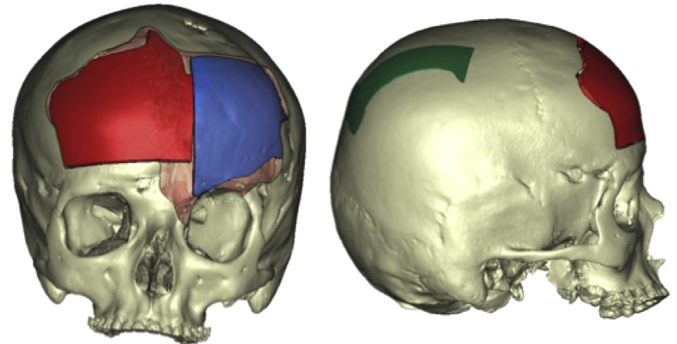


Fig. 4. Bone parts to model.

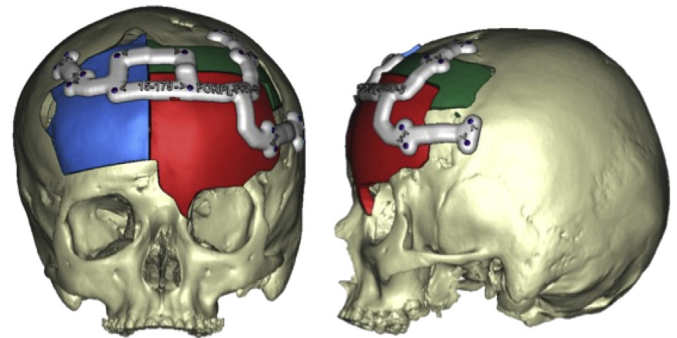


Fig. 5. Assembly of bone parts with repositioning guides.

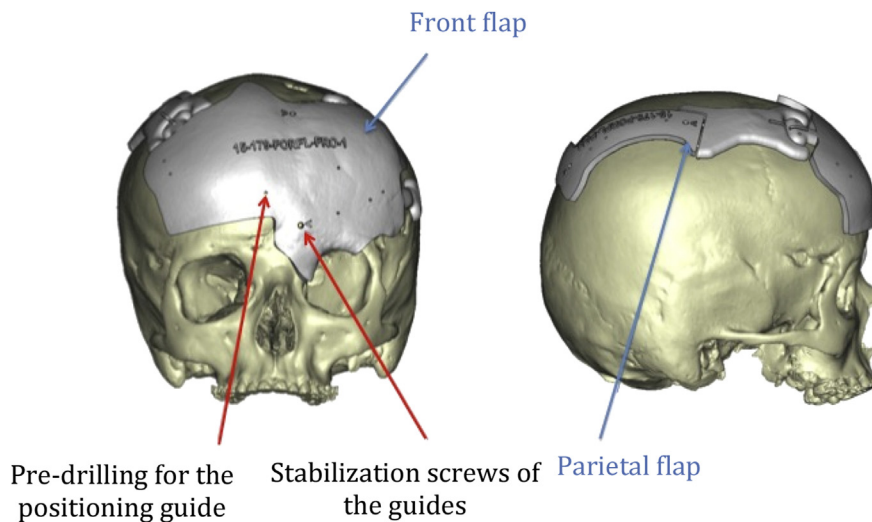


Fig. 3. Graft removal.

Download English Version:

<https://daneshyari.com/en/article/5640130>

Download Persian Version:

<https://daneshyari.com/article/5640130>

[Daneshyari.com](https://daneshyari.com)