

Competing interests

Dr Mommaerts is innovation manager at CADskills bvba.

Ethical approval

Retrospective study—not applicable.

Patient consent

Written consent was obtained.

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Differences in approach for sub-periosteal zygoma implant designs

We thank Dr Mommaerts for his comments on our technical note¹. We agree that maximal benefit should be taken from existing anatomical structures. However, in oncology cases such as the one we reported, with an extensive maxillary defect due to ablative surgery, there is a lack of such anatomical structures (Fig. 1). Moreover, most patients with large maxillary defects have been subjected to post-operative radiotherapy, which further challenges implant placement because of the inherent risk of developing osteoradionecrosis.

In the case presented, the volume, surface, and amount of perimucosal connection of the sub-periosteal zygoma implant design was not only prosthetic-driven, but also accounted for the minimal available bone remnants after a high resected maxillectomy and the fragility of the irradiated tissues. To deal with such a lack of anatomical support and compromised tissues, as well as our endeavours towards a slimmer and less voluminous single sub-periosteal zygoma implant (psSPI) design, we performed a finite element analysis (FEA) to ensure stable fixation of the psSPI to the available zygomatic bone. In addition, we applied locking screws to obtain en-bloc stabilization. This FEA approach indicated that no failure of the designed implant will occur within 1.75×10^7 loading repetitions, reflecting 25 years in vivo². Matching an 18-month follow-up computed tomography (CT) scan to the CT scan obtained directly postoperative revealed a maximum measured deviation of 0.44 mm (Fig. 2). This deviation includes errors of both CT scans (0.4 mm and 0.6 mm thickness),

segmentations, and superimposition of the models.

While Mommaerts used sandblasting, acid-etching, and plasma surface activation for the surface of his implant³, we opted for high-gloss, polished, milled titanium in order to ease intraoral cleaning. Moreover, as we used locking screws, we did not need osseointegration-promoting surface modifications. With regard to Mommaert's concerns with not using disconnectable posts, it is our opinion that the use of disconnectable posts would be of no added benefit and would even counteract the slim and less voluminous design we prefer for oncological cases. The latter because caution has to be taken in oncology cases when it comes to penetration of the compromised soft tissues, due to scarring and/or radiation injury. Therefore, we made the deliberate decision to minimize the amount of perimucosal connection and thereby reduce the risk of peri-implant mucositis developing. Furthermore, the FEA showed that there was no need for additional posts to increase vertical support, which is a great advantage in oncology cases in which the implant is placed in highly irradiated tissues. In the event of peri-implantitis occurring, there is a very high risk of developing osteoradionecrosis. The occurrence of osteoradionecrosis in our patient case would result in loss of the implant, with likely substantial bone loss and a maxillary defect that would be very difficult to treat.

To safeguard a good result, we have imposed strict hygiene recall appointments. Professional cleaning of the oral cavity and the implant during the recall visits, in addition to strict oral hygiene maintenance by the patient herself, will be of the utmost importance to prevent



Fig. 1. Panoramic radiograph showing an extensive maxillary defect due to ablative surgery and a lack of anatomical structures to allow vertical support. To deal with the lack of anatomical support and compromised tissues, a finite element analysis was performed to design a slim, minimal volume sub-periosteal zygoma implant (psSPI) that can be reliably fixed to the remaining zygomatic bone.

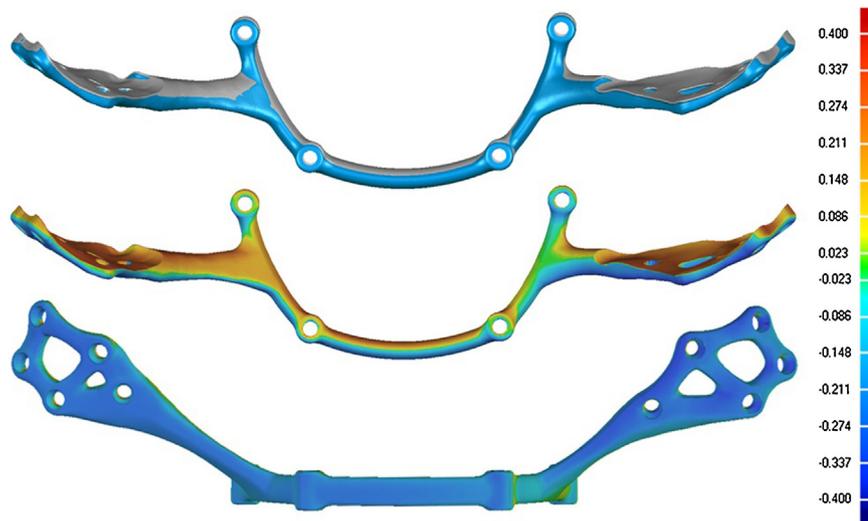


Fig. 2. Segmentations of the patient's skull derived from the direct and 18-month postoperative CT scans were aligned using the Best Fit Alignment tool in Geomagic Studio 2012 software (3D Systems, Rock Hill, SC, USA) whilst moving along an identical CAD file of the implant. Note the nearly perfect alignment of direct postoperative (grey) and 18-month follow-up (blue) implant position. This nearly perfect alignment indicates good clinical implant stability.

signs of inflammation and diagnose these early. Our patient has reported no discomfort or pain. No signs of the development of peri-implant mucositis or peri-implantitis have been observed by the dentist or oral hygienists during the 18 months of follow-up to date since placement of the psSPI.

The additively manufactured sub-periosteal jaw implant – AMSJI – developed by Mommaerts is a valid treatment option for excessive maxillary bone loss, poor bone quality, and maxillary pneumatization³. However for oncology cases, such as our case, an unmodified Mommaerts approach is not applicable, as that approach relies on vertical support and fixture on maxillary and palatal bone structures that are often no longer present.

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Competing interests

None declared.

Ethical approval

Not required.

Patient consent

Written consent was obtained.

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Beckwith–Wiedemann syndrome

I read with great interest the paper titled, “Tongue reduction in Beckwith–

Wiedemann syndrome: outcome and treatment algorithm” by Naujokat et al., published in this journal in January 2019¹. I would like to bring to the authors' attention our article published in 1995, where we looked at dentofacial growth following early partial glossectomies in patients with Beckwith–Wiedemann syndrome². I concur with the authors that early tongue reduction in cases with significant macroglossia is beneficial. In our study we clearly showed that the abnormal craniofacial morphology is most often seen as an open bite with mandibular prognathism and inferior rotation. The maxilla was also involved in all cases, being shortened and rotated superiorly. The dentofacial morphology reverted to a more normal condition following tongue surgery (Figs 1 and 2). In addition, the abnormal growth is mainly caused by the macroglossia, as evidenced by the normalizing post-surgical changes. In addition, the mandibular condyle is a passive growth center stimulated by function and not an active growth center, as seen in long bone cartilaginous epiphyses. I applaud the authors on their conclusions regarding tongue function and hope that these additional cephalometric data will be beneficial.

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Competing interests

None.