

Technical note

Minimally-invasive alternative to the extraction of deeply-impacted supernumerary teeth using a computer-designed surgical template

M. Liu^{a,1}, X. Yang^{b,2}, K. Lv^{b,*}, Z. Li^{b,2}

^a The State Key Laboratory Breeding Base of Basic Science of Stomatology (Hubei-MOST) and Key Laboratory of Oral Biomedicine Ministry of Education, Wuhan 430079, People's Republic of China

^b Department of Oral and Maxillofacial Trauma and Plastic Aesthetic Surgery, School and Hospital of Stomatology, Wuhan University, Wuhan 430079, People's Republic of China

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Supernumerary teeth exist throughout the dental arch and are more common in the maxilla than in the mandible.^{1,2} Impacted supernumerary teeth are usually extracted before orthodontic treatment,^{3,4} but it is difficult to remove those in the mandible that are located low on the lingual side.

Previously, we have reported using a computer-aided, image-guided operating system to discern impacted supernumerary teeth with normal tooth germs.⁵ Now we have introduced a new technique using a computer-designed 3-dimensional template to make a printed guide. This minimally-invasive approach is easy to use, effective, and efficient.

A 14-year-old girl was brought into the hospital to have four impacted supernumerary teeth removed before orthodontic treatment. Panoramic radiography showed that one of them was impacted in the right maxilla, and the other three deeply impacted in the mandible between the roots of the molars and premolars (Fig. 1).

Helical computed tomography (CT) (BrightSpeed Elite, GE Healthcare) was done and the data was stored in DICOM files using JOYE3D software (Hubei Huaqiang, High-tech Co. Ltd). The right maxillary supernumerary tooth was marked purple, the left mandibular one was blue, and the right ones grey. The 3-dimensional printed-guide template was designed to fit the surface of the occlusion like an occlusal splint. The thickness of the body and arms was 3 mm, and 2 mm, respectively, and the ends of the arms were precisely designed to match the projections of the teeth on the palatal or lingual alveolar bone (Fig. 2). The radii of the ends of the arms were designed 1 mm smaller than the projections, so that their ends indicated the sites of fenestration. The 1 mm space was designed for drilling with a burr.

During operation, the palatal or lingual mucoperiosteal flap was lifted, the bone exposed, and the 3-dimensional printed-guide template was mounted in place. The burr was used according to the preoperative design (Fig. 3) and after fenestration, all teeth were extracted successfully despite the lack of space and the associated limitations of direct visualization.

Template-guided extraction can avoid the unnecessary removal of bone, particularly when there is a strong indication for impacted supernumerary teeth in the deep palatal or lingual areas. The cost of each surgical template is currently about US\$ 150.

* Corresponding author at: School and Hospital of Stomatology, Wuhan University, 237 Luoyu Road, Wuhan 430079, Hubei, People's Republic of China. Tel.: +86 18086486139, fax: +86 27 87873260.

E-mail addresses: 2016283040063@whu.edu.cn (M. Liu),

yxw_1962@whu.edu.cn (X. Yang), lvkun@whu.edu.cn,

lvkunsurgeon318@163.com (K. Lv), lizubing@whu.edu.cn (Z. Li).

¹ Tel: +86 18963974584.

² Tel: +86 02787686050.

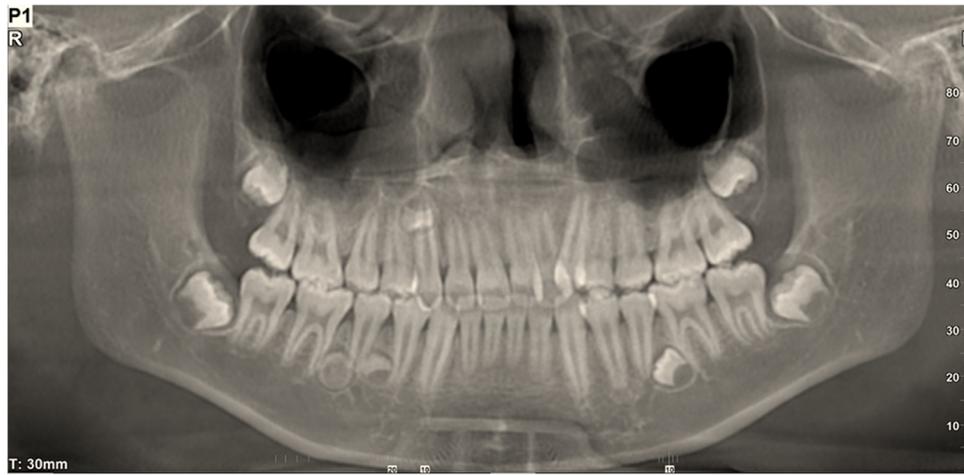


Fig. 1. Panoramic radiograph that shows that one of the supernumerary teeth was impacted in the right maxilla, and the other three were deeply impacted in the mandible and sited between the roots of molars and premolars. Note that the impacted supernumerary teeth were adjacent to the apices of the roots of permanent teeth.

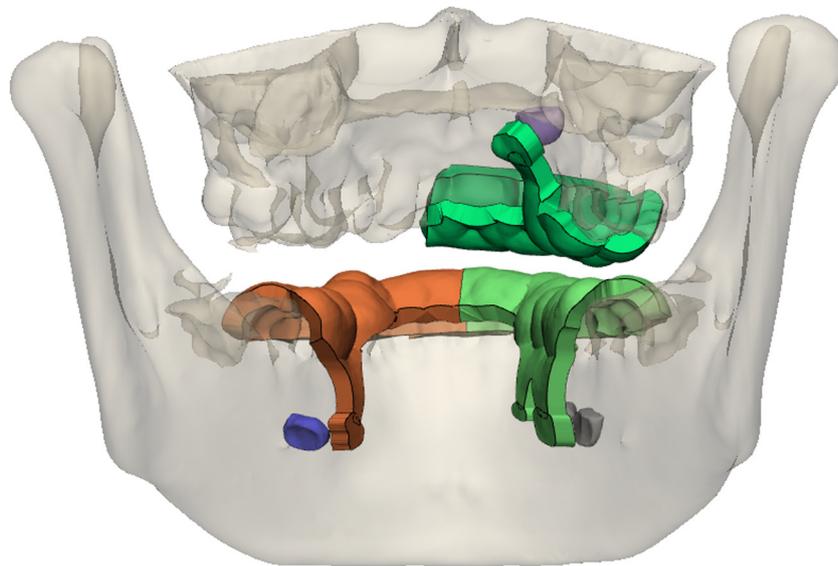


Fig. 2. The 3-dimensional printed guide template in which the right maxillary supernumerary tooth is marked purple, the left mandibular one blue, and the right ones grey. The template was designed to fit the surface of the occlusion like an occlusal splint. The ends of the arms were precisely designed to match the projections of the impacted supernumerary teeth on the palatal or lingual alveolar bone.

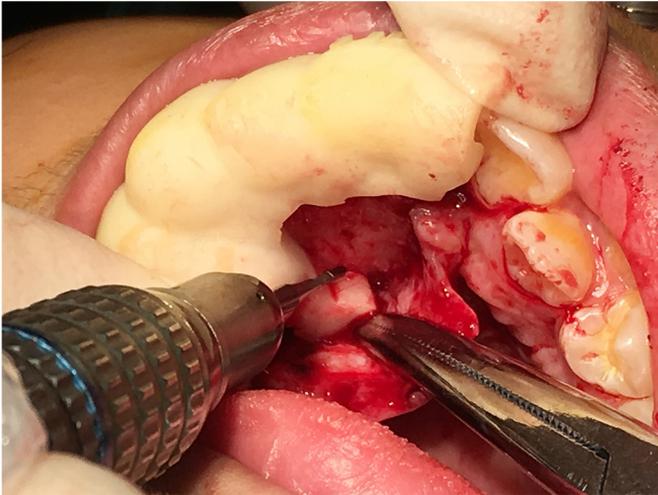


Fig. 3. During operation, the palatal or lingual mucoperiosteal flap was lifted, the bone exposed, and then the 3-dimensional printed guide template was mounted. The burr was used in the periphery of the ends of the arms according to the preoperative design.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patient's permission

This study was permitted by the School and Hospital of Stomatology, Wuhan University IRB. We have read the Helsinki

Declaration and have followed the guidelines in this investigation. Informed written consent from the patient involved in this study was obtained.

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