

Customizable template technique to harvest iliac crest bone graft for reconstructions of mandibular defects.

Técnica de template customizável para remoção de enxerto ósseo de crista ilíaca para reconstruções de defeitos mandibulares.

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ABSTRACT

Bone graft harvesting from the anterior iliac crest is a good option for reconstructing mandibular defects after trauma or other diseases. In order to achieve optimal clinical results in reconstructive surgeries with bone grafts, accurate preoperative planning and prestigious surgical technique are paramount. Therefore, this paper describes the use of a customizable template that is indicated for obtaining free iliac bone block for immediate or late mandibular reconstructions following marginal or segmental defects. The template is based on a piece of malleable metal obtained from an aluminum beverage can. It is used transoperatively to demarcate the bone graft donor site, being especially useful because of the limited access to the inner table of the anterior ilium. The described customizable template has been shown as a useful tool to easily determine the size of the bone block to be harvested from the iliac region, improving surgical time and preventing removal of insufficient bone graft.

Keywords: Bone Transplant. Mandibular Reconstruction. Bone and Bones.

INTRODUCTION

There are few reports where templates have been used to aid in mandibular reconstruction after ablative surgery. Some templates are designed to match the graft to the maxillary or mandibular defect regardless of donor-site morbidity^{1,2}. Others aid the harvesting and placement of iliac bone grafts, but are not easily sterilized and required elaborated lab work³. However, there is no simple technique that can be used for both a marginal and a segmental defect and which can be easily fabricated and sterilized to obtain an iliac bone graft. This paper describes the use of a customizable template that is indicated for obtaining free iliac bone block for immediate or late mandibular reconstructions following marginal or segmental defects.

TECHNICAL NOTE

The template is constructed preoperatively based on the size of the mandibular defect as measured on a stereolithographic model (Figure 1).

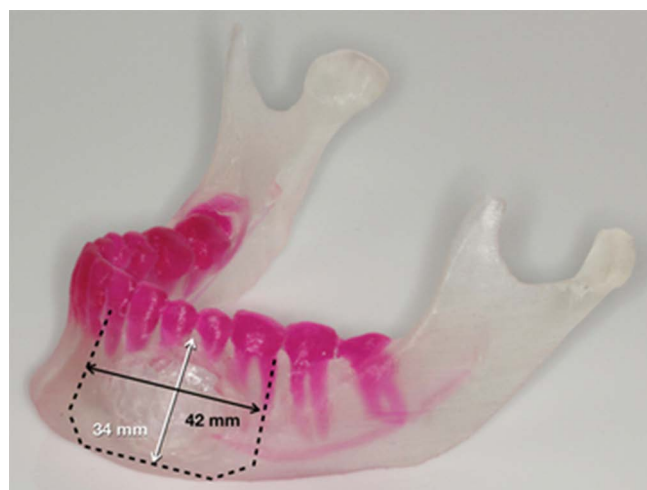


Figure 1. Stereolithographic model of a 21-year-old female who presented a multicystic ameloblastoma on the right side of the mandible, extending from the lateral incisor to the first molar. Planned marginal resection (black chain line) showed 42mm in length (black continuous line) and 34mm in height (white continuous line) of residual bone defect.

Once the dimensions of the anticipated mandibular defect are appreciated, then a template is obtained from an aluminum beverage can (Figure 2). The piece of malleable metal is trimmed to fit the mandibular defect and then it can be autoclaved.

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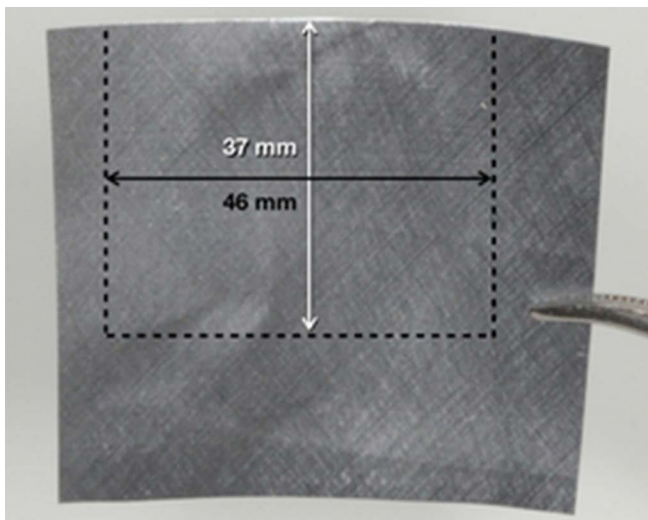


Figure 2. Template is customized to planned osteotomy on the model. Dimensions were increased by 10% to length (black continuous line) and height (white continuous line) in order to fit the bone graft.

The template is used transoperatively to demarcate the bone graft donor site. Routinely, the template is made with an increase by 10% of the dimension of the actual bone defect to allow the contouring of bone block on the recipient site. The technique illustrated is based on work by Kalk *et al.*⁴ in which the anterior part of the iliac crest is exposed, and the medial portion of the ilium bone is the donor surface. A corticocancellous bone block is harvested by making two horizontal and two vertical osteotomies using reciprocating and oscillating saws.

The template is used to optimize osteotomy lines delimitation, and it assures that the desired amount of bone is harvested, while diminishing morbidity to the donor site (Figure 3). Regardless of the iliac bone graft harvesting technique, the customizable template can help to predict the length and width of the bone block to be obtained, making the process of accommodating the bone graft on the recipient site quicker and more accurate (Figure 4). The template is especially useful because of limited access to the inner table of the anterior ilium and prevents insufficient removal of a bone block.

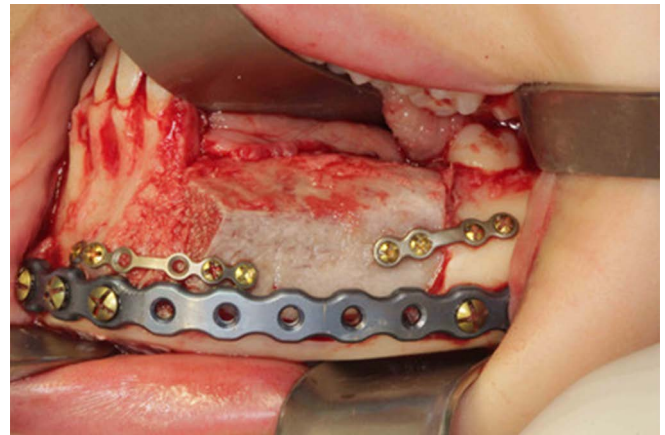


Figure 4. Clinical intraoperative view of the same patient as in figure 1 after tumor resection and bone grafting. Bone graft was obtained in adequate dimensions, allowing its appropriate placement and fixation on the recipient site.

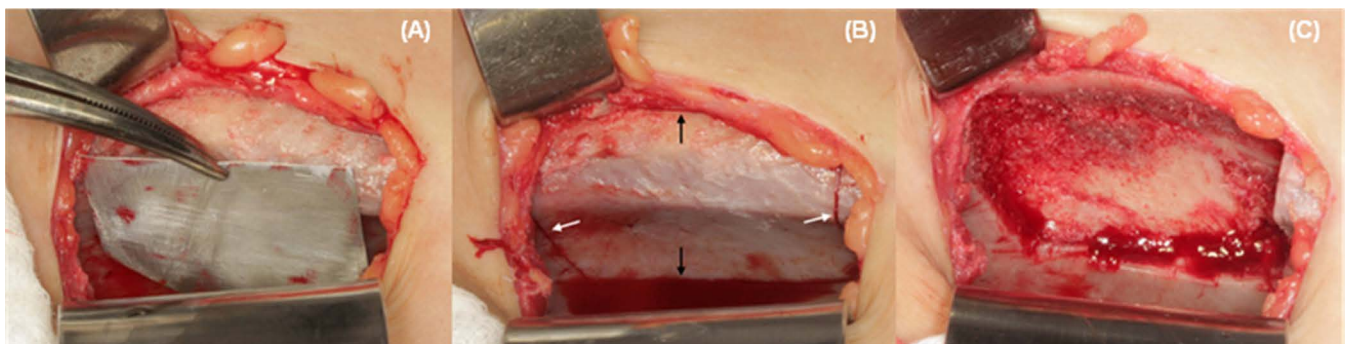


Figure 3. Clinical intraoperative view of the customizable template application. (A) template placed on the potential donor site region to delineate the dimension of the corticocancellous bone block graft to be harvested for mandibular reconstruction; (B) view of the left iliac crest after osteotomies. Length and height dimensions should match the template dimensions (arrows); (C) view of the donor site after removal of bone graft.

Smaller bone blocks will not fit the defect, resulting in poor bone incorporation, wound breakdown or residual defects that can jeopardize future implant rehabilitation. In addition, attempts to remove additional bone blocks to fill a poorly reconstructed defect increase surgical time, leading to higher rates of bone resorption and additional use of hardware. Although preoperative planning is significantly moving towards virtual planning nowadays, including surgical guides using CAD/CAM technology, numerous surgeons may not have access to such tool. On the authors' experience, the presented technique is inexpensive, easy, and a practical alternative to more sophisticated and

time-consuming virtual guides with similar clinical application for iliac crest bone graft harvesting.

DISCUSSION

It is highly desirable to reestablish functional and cosmetic properties when reconstructing marginal or segmental defects of the mandible. In order to achieve optimal clinical results in reconstructive surgeries with bone grafts, accurate preoperative planning and prestigious surgical technique are paramount. The described customizable template has been shown as a useful tool to easily determine the size of the bone block to be harvested from the iliac region, improving surgical time and preventing removal of insufficient bone graft.

R E S U M O

A remoção de enxerto da crista ilíaca anterior é uma boa opção para a reconstrução de defeitos mandibulares após ressecções por trauma ou outras doenças. Para obtenção de resultados clínicos de excelência em cirurgias reconstrutivas com enxertos ósseos, um planejamento pré-operatório preciso e uma refinada técnica cirúrgica são essenciais. Portanto, este artigo descreve o uso de um template customizável, que é indicado para obter bloco de osso ilíaco livre para reconstruções mandibulares imediatas ou tardias após defeitos marginais ou segmentares. O template é baseado em um fragmento de metal maleável obtido de uma lata de bebida de alumínio. Ele é utilizado no transoperatório para demarcar o sítio doador do enxerto ósseo e é especialmente útil devido ao acesso limitado à cortical interna da crista ilíaca. O template customizável tem se mostrado uma ferramenta de fácil aplicação para determinar o tamanho do bloco de enxerto a ser coletado da região ilíaca, otimizando o tempo cirúrgico e evitando a remoção insuficiente de enxerto ósseo.

Descritores: Transplante Ósseo. Reconstrução Mandibular. Osso e Ossos.

REFERÊNCIAS

- Ohyama T, Toyoma H, Nagai E, Ohtani K. Effectiveness of surgical template for dental implants placed in bone graft. *J Prosthodont Res.* 2009;53(3):146-9.
- Pham Dang N, Lafarge A, Depeyre A, Devoize L, Barthélémy I. Virtual surgery planning and three-dimensional printing template to customize bone graft toward implant insertion. *J Craniofac Surg.* 2017;28(2):e173-5.
- Sidebottom AJ, Cawood JJ. Use of a template to aid accurate harvesting and placement of iliac bone grafts for augmentation of the jaw. *Br J Oral Maxillofac Surg.* 2003;41(4):266-9.
- Kalk WW, Raghoobar GM, Jansma J, Boering G. Morbidity from iliac crest bone harvesting. *J Oral Maxillofac Surg.* 1996;54(12):1424-9; discussion 1430.

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