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The Leicester radiotherapy bite block: an aid to head and neck radiotherapy

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SUMMARY. **We describe the construction of a custom-made bite block to be used during external beam radiotherapy to the oral cavity. The bite block is made with standard maxillofacial prosthetic techniques and materials. The design allows accurate and reproducible positioning of the perioral tissues to aid planning of radiotherapy and treatment. The compressibility of this device improves comfort for the patient, while it is in use. © 2001 The British Association of Oral and Maxillofacial Surgeons**

INTRODUCTION

External beam radiotherapy for the treatment of oral cancer commonly causes mucositis and xerostomia. The late effects on the vascularity of both hard and soft tissues of the jaws can compromise further surgical management and increase the risk of osteoradionecrosis. Damage to normal tissues can be reduced by using 'biological methods' such as an appropriate method of radiotherapy and by modifying the dose and fractionation regimen. Various 'physical methods' are also commonly used to reduce damage which include shielding, wedging, and the use of multiple fields.

The aim of planning radiotherapy is to deliver a homogeneous dose of radiation to an accurately localized 'clinical target volume' to ensure control of the tumour with minimal effect on the surrounding tissues. In planning treatment for head and neck cancer, the tongue and mandible are not static structures. Because of this, an additional margin may have to be added, which is termed the 'internal margin'. During a fractionated course of treatment, there are day-to-day variations in the position and alignment of the patient and a 'set-up margin' is added to account for this. In the head and neck, this 'set up margin' is usually about 2–4 mm. The combination of clinical target volume, internal margin, and set-up margin gives the total planning volume. To minimize damage to normal tissues this volume has to be kept as small as possible.[1]

In the treatment of oral cancer, a bite block used in conjunction with a face mask (shell) allows positioning and splinting of this tissues. The bite block opens and separates the jaws and depresses the tongue (Fig. 1).

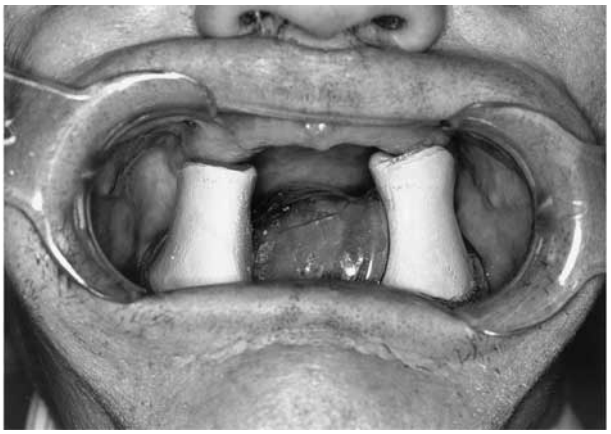

Fig. 1 Bite block in place in a patient.

This protects the opposing jaw and associated structures and can allow a smaller total treatment volume to be planned. If the tongue is being treated, then its volume is reduced by compression, and a reproducible position during each treatment session is achieved. In treating the maxilla, the dorsum of the tongue is depressed and therefore spared. Bite blocks are indicated for use in treatment to the floor of mouth, lower alveolus, anterior two-thirds of the tongue, upper alveolus, maxillary sinus, and postnasal space.

In the UK, bite blocks are made at the same time as the face mask (shell) in the 'mould room'. The designs of these blocks vary locally and have inherent faults. They are often bulky and uncomfortable to use and do not position the tissues correctly at each visit. The most popular design in current use is a silicone putty or

impression compound bite moulded to the mouth, with a syringe barrel cut down to act as an airway and tongue depressor.[2] This block is not made on models from oral impressions. It engages only the anterior teeth or alveolus and is quite cumbersome. Custom-made bite blocks using intra-oral impressions fit more accurately and improve comfort. In cases in which surgical reconstructions have been undertaken, a custom-made bite block allows an initially bulky flap to be positioned in the same way as the tongue, thereby reducing the planning target volume.

We describe the construction of a custom-made bite block, which has been used in the Leicester Royal Infirmary for the past three years. It has proved to be easy to use and comfortable for the patients during treatment.

CONSTRUCTION

In the early postoperative period, once healing of the intraoral tissues is satisfactory, upper and lower alginate impressions are taken of the jaws to include the tongue. The lower impression is made by modifying a stock tray using sheet wax to cover the dorsum of the tongue. After the models have been cast, a standard bite is registered using wax rims to the correct face height. Once articulated, an opening of 1.5–2 cm is added in excess of occluding face height established by the bite registration. This amount of jaw opening is satisfactory as the inclusion of a tongue depressor in the final bite block ensures adequate tissue separation. Any greater jaw opening requires a larger bite block that is uncomfortable to use.

The bite block is constructed by vacuum-forming a single ethylene vinyl sheet over the lower model to include the tongue. Silicone putty pillars are made posteriorly to the required opening, leaving an open anterior airway. These pillars are then covered and stabilized by a second sheet of ethylene vinyl that excludes the tongue. It is important to use only a single sheet over the tongue to maintain the flexibility of the bite block (Fig. 2).

This design can be used in most clinical settings. Modifications can be made in particular circumstances. For example, in free flap reconstructions to the maxilla, an upper flange can be made to support and compress the flap. In patients who have trismus or difficulty with a large bite block, a two-part device is made with upper and lower sections that are correctly positioned using interlocking silicone pillars.

DISCUSSION

The designs of bite blocks that are used currently have inherent faults, particularly regarding reproducibility of positioning and comfort. Bite blocks made after taking intraoral impressions given improved accuracy of fit and the ability to position intra-oral structures easily. Comfort in use is improved by using an ethylene vinyl sheet as a flange. This gives a degree of compressibility to the prosthesis, which helps placement once painful mucositis develops (Fig. 3). This is an advantage over conventional bite blocks.

The most commonly used design with a syringe barrel as an airway and tongue depressor leads to some degree of air gap. This air gap can lead to underdosage of the surface mucosa. Using the tongue flange that we describe, there is total coverage that provides a mucosa-to-prosthesis interface. In treating the maxilla, a flange

Fig. 2 Completed bite block showing silicone pillars and flexible tongue depressor.

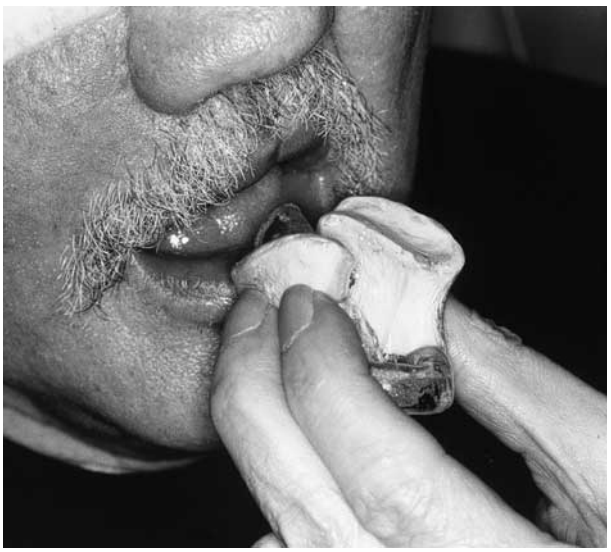

Fig. 3 Patient showing the compressibility of the bite block.

to cover the mucosa can be added to provide such an interface.

When the multidisciplinary team makes the decision to use radiotherapy, the bite block must be made and fitted before construction of the mask (shell). If radiotherapy is the primary treatment, construction can start immediately. If radiotherapy is required after operation, impressions are taken in the early postoperative period. Construction takes three stages and is supervised by a maxillofacial surgeon who has the necessary knowledge of prosthetic materials and techniques. With careful planning and good communication between surgeon and oncologist, this should not delay treatment.

Using a bite block allows a reduction in the irradiation of normal tissue. In the early stages this minimizes xerostomia and mucositis, improves comfort, and aids feeding. Later benefits include reducing both radiation caries and the risk of osteoradionecrosis, thereby maintaining quality of life. The maxillofacial surgeon is uniquely qualified to provide this custom-made bite block as part of the overall management of patients with head and neck cancer.

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