

A magnetic fixation and orientation system for orthognathic surgery planning models

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Abstract

A useful method of handling orthognathic treatment models is described that utilises magnetic attachment of study models to an articulator, allowing rapid and reliable manipulation between pre- and post-operative positions of the maxilla and/or mandible. Both the orthodontic and surgical staff can easily study planned surgical movements.

Keywords

Articulator; keyed spacer; magnets; orthognathic surgery; treatment planning.

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Fig. 1. Plaster models of the teeth on an articulator held in place with pins and elastics.

Introduction

The keyed spacer system has been one of the standard techniques used in orthognathic treatment planning^[1]. The original system incorporated plaster models of the teeth mounted on an articulator to represent the various stages of surgery. Keyed spacers allow the models to be moved between the various stages of the proposed operation and once in position, are held in place with pins and elastics (Fig. 1). Manipulation of the models using this system is fiddly and time consuming, and, therefore, can discourage the surgeon from repeated switching between pre- and post-operative positions. Magnets, incorporated within the system, can eliminate some of the steps during the construction of planning models and certainly allows easier manipulation and visualisation of the surgical stages.

This, in turn, enables the surgeon to easily study the magnitude and direction of proposed movements required, as well as the occlusion before and after surgery.

Method

The main components involved include a facebow^[2], a semi-adjustable articulator^[3], two mounting plates, two key spacers and the planning models.

The mounting plates are fitted with three-countersunk Neodymium Iron Boron magnets and fixed to the articulator. Three further magnets are placed into the bases of the upper and lower planning models.

The facebow is a device that allows the planning models to be seated in their correct pre-operative position within the articulator. Once the facebow is in place, gaps are present between the bases of the models and the mounting plates. The pre-operative key spacers are constructed by filling these gaps with blue plaster. The spacers contain pieces of ferrous metal on both surfaces and, therefore, are magnetically attached to the mounting plate on one side and the base of the model on the other. This results in a well-orientated set of pre-operative planning models held in place by rare earth magnets.

Required surgical movements are determined by clinical examination with the help of radiographs and cephalometric tracings. The movements can then be represented on the models. The upper planning model, representing the maxilla, should be moved first^[4]. If, for example, a 5 mm maxillary impaction is required, the facebow is used to position the upper model 5 mm higher within the articulator. Once in place, the remaining space between the base of the model and the mounting plate is filled with pink plaster to represent the post-operative key spacer. If a bimaxillary osteotomy is being planned, the lower model or mandible is then repositioned within the articulator and its key spacer poured in exactly the same method as for the maxilla.

To transfer the jaw relationships to the surgical setting, plastic splints or inter-occlusal acrylic wafers are fabricated^[5]. Once the maxilla/mandible has been dis-impacted within

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Fig. 2. Magnetic system showing ease of separation of components allowing rapid inter-change between pre and post-operative stages. Note movements required are clearly shown on side of pink spacers.

the mouth, the wafer will engage the teeth and move the respective jaws to their new position.

Lesson

The point of the magnetic system is that it is very easy to separate the pre-operative key spacers from the planning models and mounting plates, and replace them with the

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post-operative spacers (Fig. 2). This results in an efficient and accurate method of treatment planning using magnetic plaster models of the teeth.

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