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CASE REPORT

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The value of surgical articulator MT in orthognathic model surgery: Technical note and case report

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Abstract

The utilize of surgical articulator MT may lead to a major reduction in time and effort that usually consuming in conventional model surgery and promoted for precise planning and surgery. It can be useful in the management of several cases of dentofacial deformities when virtual surgical planning is either unaffordable or unavailable.

KEYWORDS

dentofacial deformities, manual model surgery, orthognathic surgery, virtual surgical planning

1 | INTRODUCTION

Model surgery is considered a vital part in the planning of orthognathic surgery. Although the computerized planning has become the mainstay in modern practice, the conventional model surgery still constitutes a widely used efficient technique. We describe the use of surgical articulator MT designed to enhance the practice of the conventional technique, and mitigate some of the associated drawbacks.

In the orthognathic management of dentofacial deformities, model surgery is considered a vital part of preoperative planning. Although the virtual surgical planning (VSP) has become the mainstay in modern practice, the manual model surgery (MMS) remains an efficient and comparatively accurate technique, tested over the decades in the management of jaw deformities.[1] The increasing enthusiasm toward the VSP is greatly fueled by the need to alleviate the drawbacks of the MMS, especially those related to the several tedious clinical and laboratory steps, and their pertinent potential of errors.[2] However, applying those modern technologies entails a high learning curve and cost, in addition to the need for an experienced third party for software planning.[3,4] That still constitutes a major obstacle for the wide implementation of VSP especially in some parts of the world with limited resources.[3] In this article, we describe the use of a surgical articulator system (Surgical MT, Bio-Art) for surgical planning and wafer fabrication for a case of occlusal plane canting due to condylar hyperplasia. The device designed to enhance the practice of MMS and mitigate the efforts and time usually needed for the routine laboratory works.

2 | CASE PRESENTATION

A 19-year-old female presented with facial asymmetry and canting of an occlusal plane due to right-sided condylar hyperplasia that starts developing at her puberty. Preoperative workup included a detailed clinical examination, photography, dental impressions, and cephalometric analysis (Figure 1A,B).

The MMS started with the face bow registration and transfer followed by upper dental cast mounting on the adjustable platform of the surgical articulator MT, reflecting the orientation of the patient's maxilla in the 3D space of the articulator. The lower cast then mounted according to the registered patient's occlusion in the centric relation (Figure 2A,B).

The planned correction of the maxillary cant was carried out by rotation of the upper dental cast around the coronal plane, through increasing the posterior height of the upper frame on the right side to the planned extent, while maintaining the

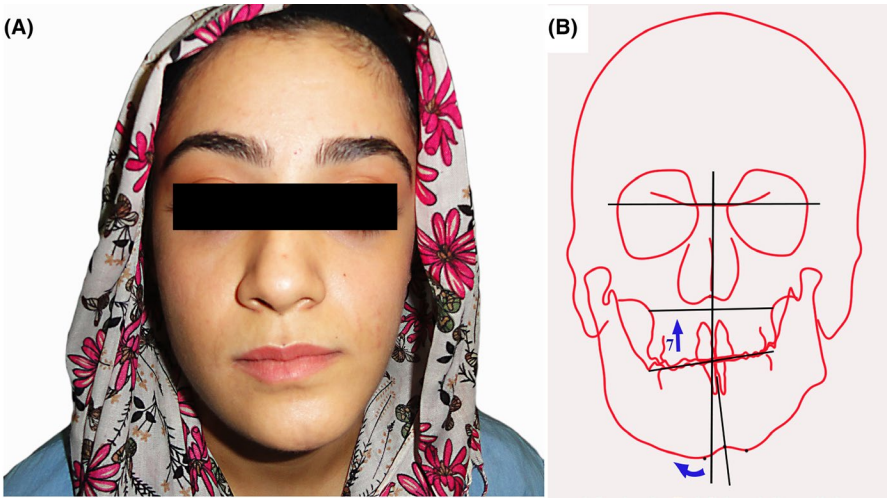

FIGURE 1 Preoperative view. A, Facial asymmetry with mandibular deviation toward the left. B, Anteroposterior cephalometric view demonstrates the dentofacial disproportion and the cant of the occlusal plane caused by the right condylar hyperplasia

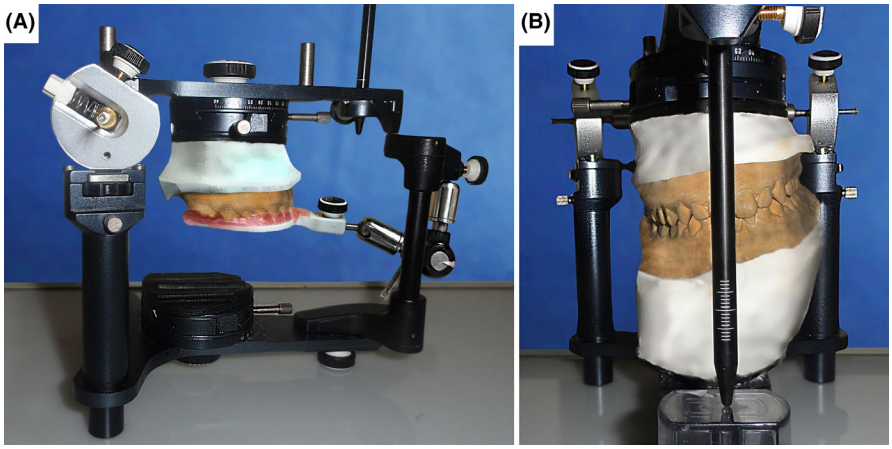

FIGURE 2 Dental casts mounting. A, Upper cast mounted on the adjustable platform based on the registered face bow transfer set. B, Lower cast mounted in patient's occlusion registered in centric relation

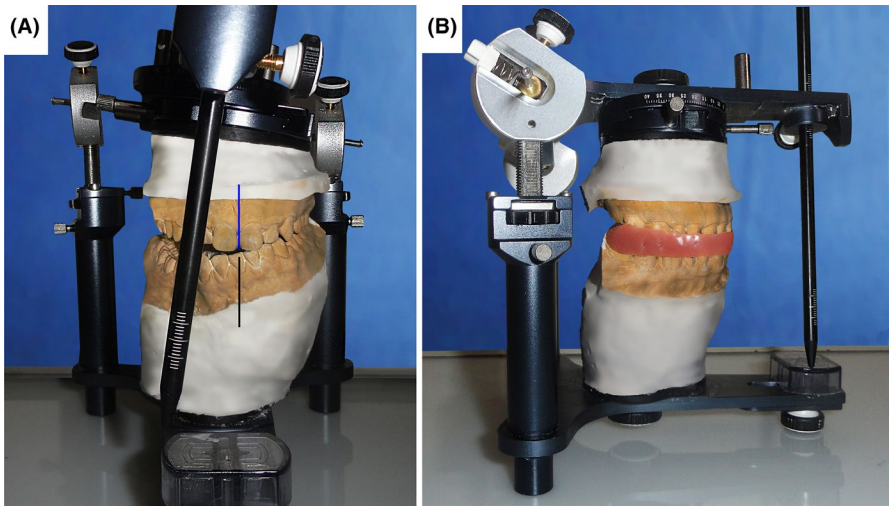

FIGURE 3 Correction of maxillary cant and surgical wafer fabrication. A, Rotation of the upper cast vertically in the coronal plane by increasing the right posterior height of the upper frame with preservation of dental-facial midline coincidence. B, Wafer fabrication. See the height adjustment pulley of the upper frame and the millimeter-scale side rod

anterior height at the incisal pin. That was performed by rotating the height adjustment pulley that controls the extrusion of a side rod with a millimeter scale. Fabrication of surgical wafer then followed. Upon occlusal plane correction, a shift in the upper midline created toward the right side and subsequently addressed by transverse relocation of the upper cast on the adjustable platform toward the planned position to coincide with the marked facial midline (Figure 3A,B).

The magnitude of the planned correction in the vertical direction was determined by measuring the change in the

FIGURE 4 Intraoperative view demonstrates maxillary arch fixated in the planned position after Lefort I osteotomy, guided by the surgical wafer

distance between the buccal cusps of the upper and lower first molars before and after the height adjustment of the upper frame.

At surgery, Lefort I osteotomy was performed first to seat the maxilla in the planned position guided by the surgical wafer (Figure 4), followed by bilateral sagittal split osteotomy (BSSO) of the mandible which followed the maxilla.

The postoperative view (Figure 5A,B) demonstrates the improvement of facial appearance and correction of both facial asymmetry and the cant of the occlusal plane.

3 | DISCUSSION

In this article, we describe the use of a surgical articulator system (Surgical MT, Bio-Art) for surgical planning and wafer fabrication for a case of occlusal plane canting due to condylar hyperplasia. The device designed to enhance the practice of MMS and mitigate the efforts and time usually needed for the routine laboratory works. It allows for planning through an adjustable mounting platform that enables an accurate movement of the dental casts along a 25 mm radius in anteroposterior and transverse directions besides a 360° rotation, in addition to pulley-controlled 70-mm posterior rods that together with the incisal pin enable vertical height control of the whole upper frame anteriorly and/or posteriorly.

We think that using surgical articulator MT promotes the execution of efficient MMS and the fabrication of accurate surgical wafers. The most significant technical feature is the ability to perform precise 3D positional adjustment of the dental models, and surgical planning without the tedious and time-consuming conventional cast separation procedure. However, limiting aspects exist: There is a difficulty in planning for segmental jaw surgery, and lack of ability to perform lower cast movement in a vertical plane. Additionally, there is a limitation in decreasing the posterior vertical height of the upper frame in planning for maxillary dis-impaction procedures. This can be resolved by first setting the height of the upper frame above the zero levels to the required extent, before mounting the dental cast, to be lowered later according to the plan. We also found a lack of coincidence between the millimeter scale of the side rod of the upper frame and the actual movement of the dental cast, especially in cases of asymmetric change of the posterior height as in our case. That is why we prefer using a Vernier caliper to measure the change between two selected landmarks on the upper and lower dental casts before and after movement.

4 | CONCLUSION

The use of surgical articulator MT resulted in a major reduction in time and effort usually required in conventional MMS and promoted for precise planning and surgery. It can be useful in the management of several dentofacial deformities cases when the VSP is either unaffordable or unavailable.

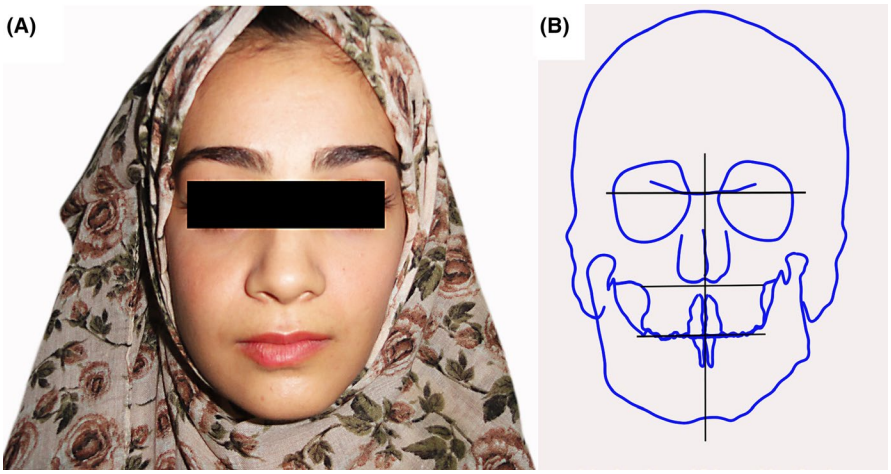

FIGURE 5 The postoperative view demonstrates a significant improvement of facial appearance with correction of the asymmetry and the occlusal plane cant

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

SAI: involved in care of patient and final editor of manuscript; HAA: contributed to conceptualizing and writing of the paper, design, data collection and analysis, and final approval, reviewed all drafts, prepared the submission, and approved the final draft.

ETHICAL APPROVAL

Not required.

INFORMED CONSENT

Informed consent was obtained from the patient to publish the case.

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