

# “LANDMARK FREE” COMPUTERIZED OPTIMAL SYMMETRIC PLANE SYSTEM



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## Introduction

Symmetry is one of the most important factors for facial attractiveness. Unequal condylar growth has been shown to be a major cause of facial asymmetry. The NCKU team has proposed a matching optimal symmetry plane (OSP) method to evaluate and quantify the asymmetry of mandible and midface. Wong et al. have found various patterns of mandible misalignment<sup>1</sup> (Fig. 1). By using the matching OSP analysis, we can identify the direction of mandible rotation three dimensionally. Furthermore, by NCKU navigation system which integrate the 3D virtual planning and physical model surgery, we can visualize the movement of bony segment and occlusion on articulator simultaneously (Fig. 2).

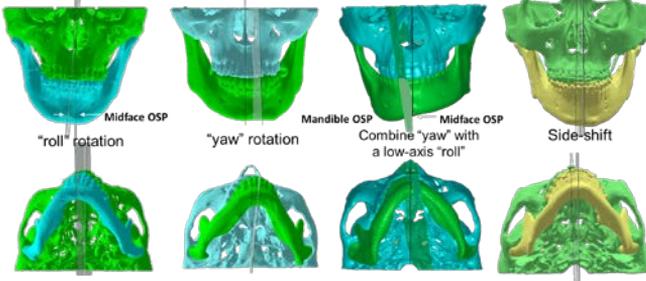


Figure 1. Four Patterns of Facial Asymmetry

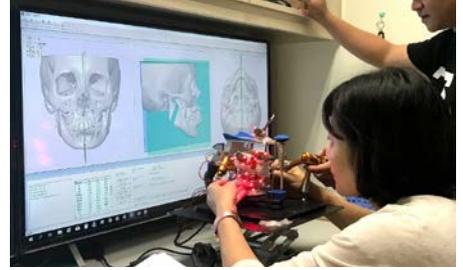
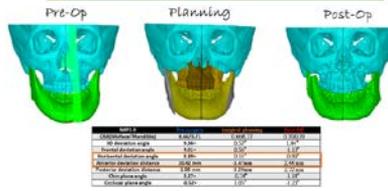


Figure 2. Visualize bony movement and occlusion simultaneously

**Case 1:** 21 y/o female, skeletal CIII malocclusion with mandible prognathism, facial asymmetry and anterior openbite



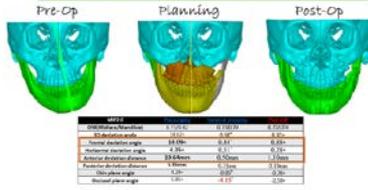
Post-OP 3D CT model and OSP data reveal that mandible had been re-aligned. The Horizontal deviation angle had been decreased to 0.89°. The anterior deviation distance had been decreased to 2.44 mm.



**Case 2:** 21 y/o female, skeletal CI malocclusion with facial asymmetry and unilateral crossbite.



Post-OP 3D CT model and OSP data reveal that mandible had been re-aligned. The Horizontal deviation angle had been decreased to 0.88°. The anterior deviation distance had been decreased to 1.10 mm.



**Case 3:** 17 y/o male, skeletal CIII malocclusion with mandible prognathism, facial asymmetry, tooth #7 impaction



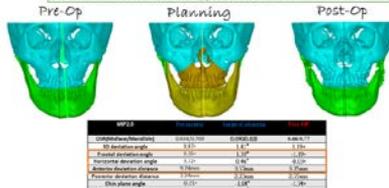
Using the navigation system and plan-to-plan method, we realigned the mandible OSP with midface OSP, then evaluate the structure symmetry of the mandible with mirror image. Oral surgeon performed the bone trimming on left mandibular border.



**Case 4:** 18 y/o male, skeletal CIII malocclusion with mandible prognathism, facial asymmetry, nasal septum deviation and crowding.



Post-op 3D CT model and OSP data reveal that mandible had been re-aligned. The Horizontal deviation angle had been decreased to 0.63° and the anterior deviation distance also had been decreased intentionally to 3.25 mm to meet the ANS and upper dental midline.



## Discussion

The National Cheng Kung University, NCKU team established a “landmark free” computerized method called Optimal Symmetry Plane (OSP) system to evaluate the symmetry of facial skeleton. By using the matching OSP analysis, we tried to identify the spatial direction of the midface and the mandible in three dimensions. **During treatment planning of above cases, we adjusted the dental cast on articulator, virtual bone segments with Optimal Symmetry Plane (OSP) moves to corresponding position on screen.** Orthodontists can foresee the occlusion on the articulator, oral surgeon can predict facial profile on the computer. It's truly integration of virtual reality. For the case with extensive rotation of the mandible, modified osteotomy and bone grafting could be planned in advance. For some cases, structure asymmetry of the mandible could be found, and bony trimming can be eliminated after mandible re-alignment. For the patient with nose deviation, final facial midline could be adjusted to meet the facial harmony.

## Conclusion

Optimal symmetry plane (OSP) method could analyze the patterns of mandible misalignment in three dimensions. By NCKU navigation system, we could **align the mandible OSP to midface OSP in the virtual planning software and check the occlusion on the physical model simultaneously.**

## References

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- Wong TY, Liu JK, Wu TC, et al. Plane-to-plane analysis of mandibular misalignment in patients with facial asymmetry. *Am J Orthod Dentofacial Orthop.* 2018;153(1):70-80.

There is no conflict of interest for all the authors