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The combination of the mandibular Köle procedure and bilateral sagittal splitting in orthognathic surgery has positive effect in esthetics and function for short-throat-length skeletal class III patient

KEYWORDS

Virtual surgical planning (VSP);
Orthognathic surgery;
Köle procedure;
Obstructive sleep apnea

Class III malocclusion is characterized by a variety of skeletal and dental components. In managing those dental or skeletal discrepancies, virtual surgical planning and orthognathic surgery is often unavoidable.^{1,2} In recent years, surgical techniques and concepts have progressed greatly. Thus, obtaining optimal occlusion and facial appearance is not the only purpose of surgery. Literatures have reported that the total pharyngeal volumes were significantly reduced after large mandibular setback movements.³ In certain condition, the combination of the mandibular Köle procedure with the bilateral sagittal split osteotomy (BSSO) is a surgical alternative in which segmental subapical osteotomy can be used to reposition the lower incisors and reduce the amount of total mandibular setback avoiding reducing airway space subsequently. Here we present a case of jaw disharmony with Class III skeletal relationship and bimaxillary protrusion and the patient benefited from BSSO with the Köle procedure.

A 30-year-old-male patient came to our outpatient department with the chief complaint of his underbite occlusion and protruding appearance. Clinical findings revealed a skeletal class III relationship with high mandibular plane angle and short throat length (Fig. 1a–d). The most

concerning point was that when correcting his protrusion appearance under short throat length, a large mandibular setback to reach Class I molar relationship might further worsen his lateral profile and challenge his pharyngeal airway. Thus, how to setback his protruding bimaxillary dentition with minimal mandibular setback become the key to success. Consequently, the surgical movements were designed via virtual surgical planning (VSP) as follows: one-piece Le-fort I osteotomy to impact his maxilla for 4 mm and setback for 2 mm to correct his gummy smile and maxillary protrusion; BSSO for mandibular setback of 2.49 mm along with the Köle procedure to retract the lower incisors of 7.33 mm, achieving a total setback of 9.82 mm at the lower central incisal tip (Fig. 1e and f). The healing and recovering phase went uneventfully, and the post-operation airway, occlusion and profile were encouraging (Fig. 1a–d).

In 1959, Köle published a surgical procedure to facilitate subsequent orthodontic treatment in which subapical osteotomy was made to move the anterior alveolar bone housing and teeth within as a block.⁴ Advantages of the Köle procedure in mandibular prognathism are many, and most notable ones are treatment time reduction and improvement of the lip profile.⁵ Because post-operative

<https://doi.org/10.1016/j.jds.2022.07.020>

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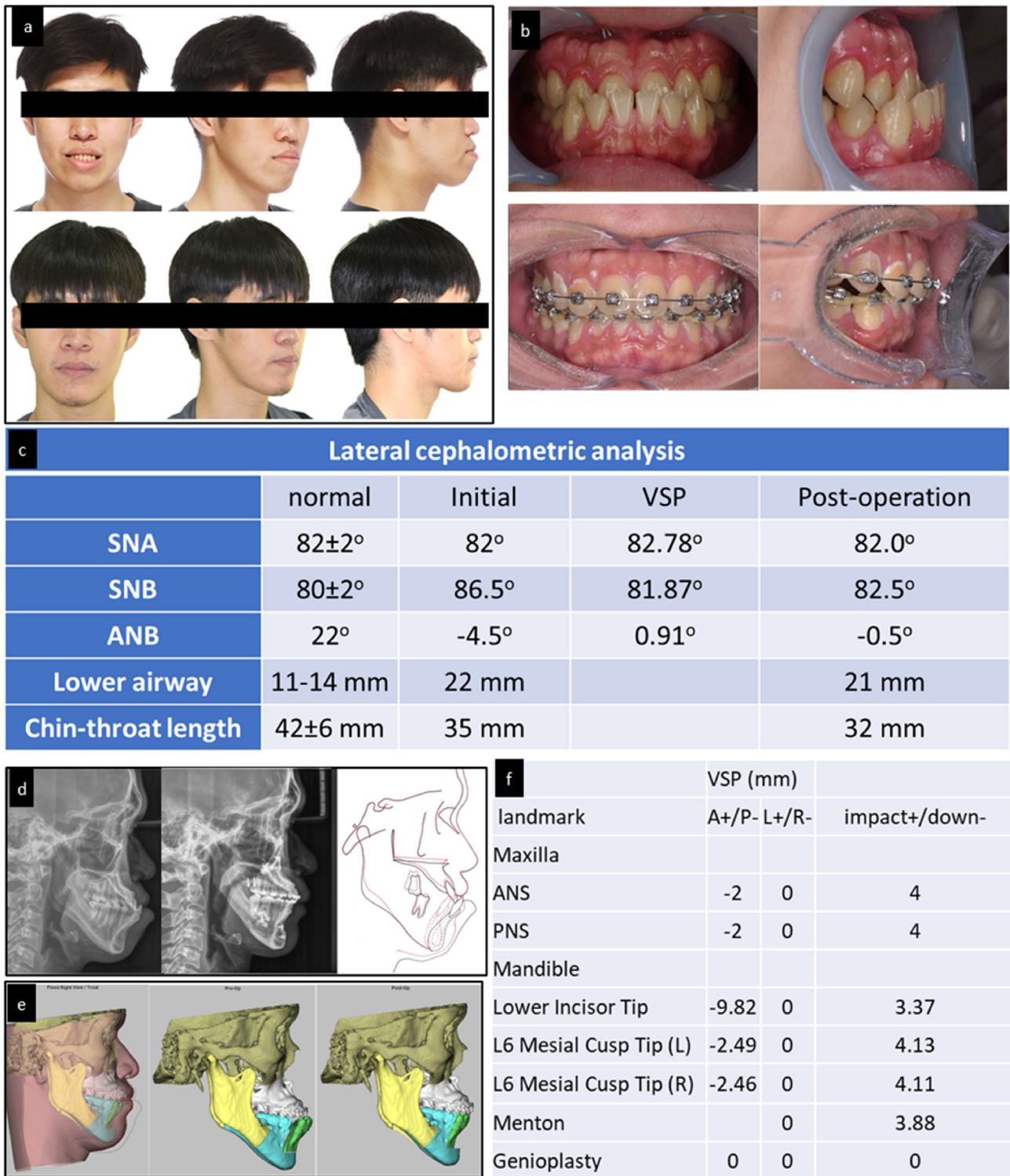


Figure 1 Clinical photographs, virtual surgical planning (VSP) demonstrations, lateral cephalogram and analysis of our patient. (a) Preoperative and 6-month-postoperative extra-oral photographs. (b) Preoperative and 6-month-postoperative intra-oral photographs. (c) Comparison of VSP, preoperative and 1.5-year-postoperative cephalometric analysis. (d) Preoperative and 1.5-year-postoperative lateral cephalometric films. (e) Demonstrations of preoperative and postoperative VSP. (f) Surgical plan of VSP. The movements of the landmarks were measured in millimeter. (Abbreviations: A, move to anterior position; P, move to posterior position; L, move to left; R, move to right; impact, move to upper position; down, move to lower position).

occlusion, facial profile, and compression of pharyngeal airway might cause obstructive sleep apnea, it is recommended to combine surgeries of different sites of the jaws to minimize the linear migration of each bone block. In a profile with a prognathic mandible yet insufficient chin contour, it is undoubtedly a dilemma for the surgeon when designing the surgical movement. Notwithstanding the difficult situation, our patient had benefit from BSSO with the Köle procedure under minimal mandibular retraction in which a two-fold result was obtained: preserving the airway volume and a satisfactory facial profile with good occlusion. In our opinion, when diagnosed properly, combining the Köle procedure to mandibular surgeries can be a powerful tool to achieve favorable results in both esthetics and function for the patients.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

None.

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Received 18 July 2022
Final revision received 24 July 2022
Available online 12 August 2022