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Long-term evaluation of swallowing function before and after sagittal split ramus osteotomy

S. Namaki[1], N. Maekawa[1], J. Iwata[1], K. Sawada[2], M. Namaki[3], T. Bjornland[4], Y. Yonehara[1]

[1]Department of Oral and Maxillofacial Surgery, Nihon University School of Dentistry, Tokyo, Japan; [2]Department of Oral and Maxillofacial Radiology, Nihon University School of Dentistry, Tokyo, Japan; [3]Department of Oral and Maxillofacial Surgery, Juntendo University School of Medicine, Tokyo, Japan; [4]Department of Oral Surgery and Oral Medicine, Faculty of Dentistry, University of Oslo, Oslo, Norway

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Abstract. The aim of this study was to determine whether mandibular setback by sagittal split ramus osteotomy (SSRO) influences swallowing function. The subjects were 14 patients with skeletal class III malocclusions who underwent setback surgery by SSRO. Morphological changes were studied on cephalograms, and swallowing function was evaluated by videofluorography before the operation (T0) and at 7–10 days (T1), 3 months (T2), and 6 months (T3) after surgery. The angle between nasion, sella, and hyoid bone (HSN) and the sella–hyoid distance had increased significantly at T1. The hyoid bone returned to the preoperative position at T2. There were no significant changes in the oropharyngeal space at any time. On videofluorographic assessment, lingual movement, soft palate movement, and epiglottic movement had decreased at T1, but all patients recovered at T2. The oral transit time was significantly longer at T1 than at T0. Our results confirm that SSRO influences swallowing function. Swallowing function appears to stabilize by 3 months after surgery.

Key words: swallowing function; orthognathic surgery; oropharyngeal airway; hyoid bone.

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The sagittal split ramus osteotomy (SSRO) is a common treatment for mandibular prognathism and results in functional and aesthetic improvements. Mandibular setback influences the tongue and pharyngeal airway.[1,2]

Several studies have shown changes in craniofacial, tongue, hyoid, and pharyngeal morphology after mandibular setback surgery.[3–11] Such changes include a reduction in pharyngeal airway volume and changes in the tongue and hyoid positions on static imaging techniques, such as lateral and posterior–anterior cephalography, computed tomography (CT),[8–10] and magnetic resonance imaging (MRI)[11]; however the functional consequences of these changes remain unclear.

Previous studies have assessed the effects of mandibular setback surgery on masticatory function,[12,13] stomatognathic function,[14] sleep apnea,[1,2] psychosocial status,[15] and articulation.[16] However, whether or not mandibular setback affects swallowing movements remains a matter of debate.

Changes in tongue position may influence swallowing function during the oral preparatory phase and oral phase. Altered hyoid position and pharyngeal airway volume may affect swallowing function during the pharyngeal phase. Generally, the effects of various diseases on swallowing function are evaluated by videofluorography,[17–19] which is used to assess the oral and pharyngeal transit times.[20]

The aim of this study was to investigate the effects of SSRO and mandibular setback on craniofacial and pharyngeal morphology and on swallowing function. Craniofacial and pharyngeal morphology and swallowing function were evaluated by videofluorography before and after SSRO.

Materials and methods

Subjects

The subjects were 14 patients (two men and 12 women; average age 25.9 ± 10.6 years) with dentofacial deformities, who had skeletal class III malocclusion with or without open bite and asymmetry. The patients underwent SSRO in the department of oral and maxillofacial surgery of the study hospital. Patients who underwent Le Fort I osteotomy were excluded. All subjects received preoperative and postoperative orthodontic treatment. SSRO was performed according to the Obwegeser[21] and Dal Pont[22] method. The fragments were fixed with the use of titanium plates (Würzburg Titanium Plating System; Stryker Leibinger GmbH, Freiburg, Germany) and resorbable fixation devices (Super Fixsorb-MX; Takiron Co., Osaka, Japan). Each subject received a preoperative dose of dexamethasone (mean dose 4.5 mg) immediately prior to surgery, followed by postoperative treatment with dexamethasone (mean dose 2.1 mg/day) for 2 days to control postoperative swelling. The average amount of mandibular setback was 7.65 ± 3.23 mm. Intermaxillary fixation with the use of elastics or steel wires was maintained for 4–6 days postoperatively.

Informed consent was obtained from all subjects after explaining the study procedures in detail. The protocol was approved by the institutional ethics committee.

Cephalometric analysis

Morphological changes were evaluated on lateral cephalometric radiographs that

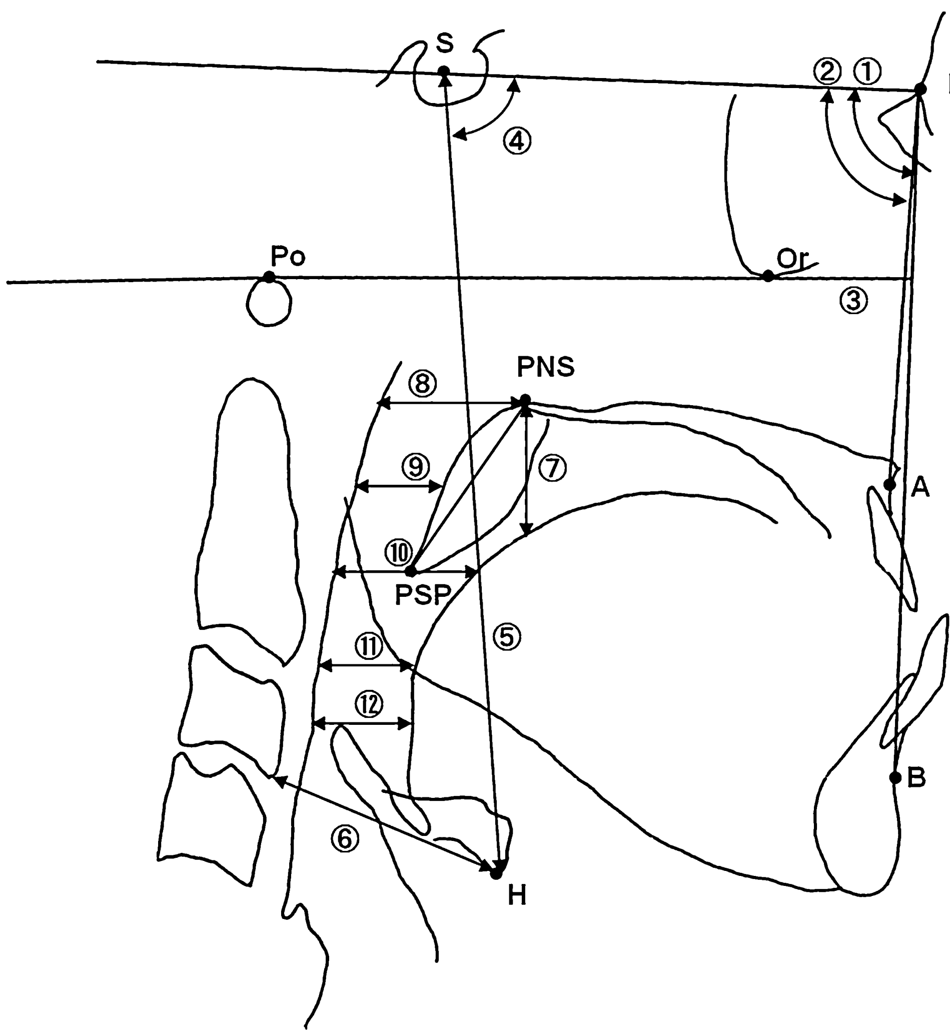

Fig. 1. Cephalometric linear and angular measurements. (1) sella–nasion–A point (SNA) angle. (2) sella–nasion–B point (SNB) angle. (3) A point–nasion–B point (ANB) angle. (4) HSN angle: angle between nasion, sella, and hyoid bone (lowest point of hyoid bone). (5) S–H: distance from sella to hyoid bone. (6) C3–H: distance from the most antero-inferior point of the third cervical vertebra to the hyoid bone. (7) D1: distance from posterior nasal spine (PNS) to the dorsum of the tongue on a line perpendicular to the S–N line. (8) PPS: distance from posterior pharyngeal wall to the PNS on a line parallel to the Frankfort horizontal (FH) plane. (9) SPPS: distance from the posterior pharyngeal wall to the middle of the line from PNS to PSP (tip of the soft palate) on a line parallel to the FH plane. (10) MPS: distance from the posterior pharyngeal wall to the dorsum of the tongue on a line parallel to the FH plane that runs through PSP. (11) IPS: distance from the posterior pharyngeal wall to the surface of the tongue on a line parallel to the FH plane that runs through C2 (the most antero-inferior point of the second cervical vertebra). (12) EPS: distance from the posterior pharyngeal wall to the tip of the epiglottis on a line parallel to the FH plane.