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Appearance on face reading (cheek line) after orthognathic surgery

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Abstract

The cheek line (face reading) is an aesthetic element of the facial profile. The purpose of our study was to investigate the changes in the cheek line after mandibular setback surgery. Forty patients (20 female and 20 male, mean (SD) age 22 (5) years) were diagnosed with mandibular prognathism and treated by intraoral vertical ramus osteotomy alone. Cephalograms were obtained before operation (T1), at least a year postoperatively (T2), and final surgical changes over a year (T2-T1). The cheek line and landmarks (soft and hard tissues) were compared using the paired *t* test. The hypothesis was that the cheek line did not change significantly after mandibular setback. At the time of the final follow-up (T2-T1), the mean (SD) horizontal setback of pogonion (Pog) was 12.3 (3.5) mm for women and 11.7 (4.3) mm for men. The ratios of soft:hard tissue, labrale inferius:incisor inferius, labiomental sulcus:point B, soft tissue Pog:Pog, and cheek point:Pog in women were 0.96, 0.98, 0.98, and 0.08, and in men 0.91, 1.01, 0.94, and 0.13, respectively. The nasolabial and cervicomental angles in women were significantly increased by 11.1° and 11.4°, respectively, and in men the nasolabial angle was significantly increased by 11.1° and the mentolabial angle reduced by 9.9°. The cheek line (T2-T1) was moved significantly forwards. The hypothesis was therefore rejected. In conclusion, the cheek line was advanced significantly after isolated mandibular setback.

Keywords: Cheek line; Facial profile; Mandibular prognathism; Mandibular setback; Orthognathic surgery

Introduction

Severe malocclusion accompanied by facial deformity indicates potentially abnormal development of the facial bones. The incidence of angle Class III malocclusion in Asians is roughly 15%-23%, which is higher than it is in those of white European origin.[1–5] Of these, 63%-75% are classified as having skeletal Class III malocclusion.[1,5,6] Mandibular prognathism is a type of severe skeletal Class III malocclusion that causes notable protrusion in the lower face, and underdevelopment of the midface. The cheek line (face reading) is a curve-shaped line of soft tissue at the forefront of the

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cheek bone, and is a crucial landmark in facial aesthetics. It is located between the nose and the cheek bone in the lateral view of the human face. Because the cheek bones of Asians are more laterally developed than those of people of white European origin, the soft tissues covering their cheek bones are comparatively flatter.

To ameliorate the effects of underdevelopment of the midface in these patients, the maxilla is usually advanced using a Le Fort I advancement osteotomy. We have found clinically that the cheek line is advanced after isolated mandibular setback in the treatment of mandibular prognathism. During mandibular setback, the mandible also causes the overlying tissue (muscles and soft tissue) to move backwards and accumulate in the space between the cheilions and the cheek bones. Several studies have investigated changes in soft tissues after treatment of mandibular prognathism by orthognathic surgery, but we know of no report of changes in the cheek line after mandibular setback alone.

The aim of the present study was to investigate postoperative changes in the cheek line and the facial profile after mandibular setback alone.

Patients and methods

This was a retrospective study approved by the institutional review board of the Medical University Hospital.

Forty patients (20 women and 20 men, mean (SD) ages 21(5) and 22 (6) years, respectively) were diagnosed with mandibular prognathism, and they all had isolated intraoral vertical ramus osteotomy at the Medical University Hospital. Patients were excluded from the study if they had craniofacial anomalies or conditions such as cleft lip or cleft palate, or facial facial trauma, and if they had had other operations such as genioplasty and maxillary advancement. The following landmarks were identified: sella (S), nasion (N), point A (A), incision superius (Is), incision inferius (Ii), point B (B), pogonion (Pog), subnasale (Sn), labrale superius (Ls), labrale inferius (Li), labiomental sulcus (B′), soft tissue pogonion (Pog′), pronasale (Prn, tip of the nose), anterior nasal spine (ANS), posterior nasal spine (PNS), and menton (Me). This coordinate system had its origin at point N and its x axis at an upward 7° of the sella–nasion (S-N) line as the horizontal axis. The line that passes through the S and perpendicular to the X-axis was designated the Y-axis (Fig. 1).

The baseline of the cheek line (cheek point No. 5 = C5) was through the pronasale (Prn: tip of the nose) and parallel to the X-axis. The cheek points were marked every 3 mm above or below the C5 point (C1: +12 mm, C2: +9 mm, C3: +6 mm, C4: +3 mm, C6: −3 mm, and C7: −6 mm). The variables related to the angular cephalometric measurements were identified to evaluate the maxillary and mandibular positions, and were: SNA angle, SNB angle, ANB angle, Is-PP (Is to palatal plane) angle, Ii-MP (Ii to mandibular plane) angle, nasolabial (NLA) angle, mentolabial (MLA) angle, and cervicomental (CMA) angle. The cephalograms were collected first one month before operation (T1), secondly over one year after operation (T2), and finally the surgical changes over one year (T2-T1). Preoperative (T1) and final postoperative images (T2) are shown in Fig. 2A and B.

Statistical analysis

Data were analysed with the aid of IBM SPSS Statistics for Windows (version 20, IBM Corp, Armonk, NY, USA) and probabilities of less than 0.05 were accepted as significant. The significance of the differences between landmarks and measurements were compared using paired *t* tests. The hypothesis was that the cheek line was not changed significantly by mandibular setback.

Results

The horizontal changes in the whole group of patients (T2-T1) in Ii, B, and Pog showed significant setbacks of 10.8, 11.3, and 12.0 mm, respectively (Table 1). The accompanying horizontal soft tissue changes in the Ls, Li, B′, and Pog′ showed significant backwards movements of 1.7, 10.1, 11.2, and 11.5 mm, respectively. The horizontal changes in the female patients (T2-T1) in Ii, B, and Pog showed significant setbacks of 11.0, 11.6, and 12.3 mm, respectively. The accompanying horizontal soft tissue changes in the Ls, Li, B′, and Pog′ showed significant backward movements of 1.5, 10.6, 11.4, and 12.0 mm, respectively.

The horizontal changes in the male patients (T2-T1) in Ii, B, and Pog showed significant setbacks of 10.6, 11.0, and 11.7 mm, respectively. The accompanying horizontal soft tissue changes in the Ls, Li, B′, and Pog′ showed significant backward movements of 1.9, 9.6, 11.1, and 11.0 mm, respectively. There were no significant differences between the sexes.

The vertical changes in the whole group of patients (T2-T1) in Is and Ii showed a significant downward change of 1.2 mm and an upward change of 1.3 mm, respectively (Table 2). The accompanying vertical soft tissue changes in the Ls, Li, and Pog′ showed significant downward movements of 1.6, 2.5, and 1.6 mm, respectively. The vertical change among female patients (T2-T1) in Is showed a significant downward change of 1.2 mm. The accompanying vertical soft tissue changes in the Ls, Li, B′ and Pog′ showed significant downward movements of 1.6, 2.6, 1.7, and 2.1 mm, respectively.

The vertical changes among the male patients (T2-T1) in Ii and B showed significant upward changes of 1.9 and 2.0 mm, respectively. The accompanying vertical soft tissue changes in the Ls and Li showed significant downward movements of 1.6 and 2.5 mm, respectively. The B point among the female patients had moved significantly downwards compared with that among the male patients.

Among the total patients (T2-T1) there were significant increases in the ANB angle, NLA angle, and CMA angle,

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