Correction of Lip Canting Using Bioabsorbables during Orthognathic Surgery

Young-Wook Park

Department of Oral and Maxillofacial Surgery, College of Dentistry, Gangneung-Wonju National University

Abstract

Lip canting is associated with facial asymmetry, and is one of the most challenging problems in surgical correction of facial deformities. The author corrected lip canting using bioabsorbable devices during orthognathic surgery. Soft tissue suspension procedures were performed on four patients with facial asymmetry. Lip lines improved for all patients. Over an observation period of five years, no complications were noted, nor did any late relapse develop. Furthermore, as time past, the effect of the Endotine suspension procedure increased probably due to induction of fibrosis on surrounding soft tissues.

Key words: Facial asymmetry, Lip canting, Suspension procedure, Bioabsorbable devices

Introduction

Well-balanced facial esthetic is very important in surgical treatment of patients with facial deformity. In facial asymmetry, lip canting has a significant effect on undesirable facial esthetics. In the frontal view, facial asymmetry consists of nose and chin deviation, mandibular body inclination difference, gonial angle difference, transverse occlusal plane canting and lip canting. Of these, lip canting is the most problematic, because the greater the facial asymmetry near the midline of the face, the more negative the evaluation of the face in direct face-to-face interactions[1]. Moreover, lip canting is the most challenging factor in surgical correction. However, with the increasing concern of facial esthetics, patients now want a more symmetrical facial appearance after the orthognathic surgery.

A novel bioabsorbable multi-point fixation device, Endotine® (Coapt Systems Inc., Palo Alto, CA, USA) was introduced and approved by the US Food and Drug Administration for soft tissue suspension in 2003[2]. It is a biodegradable copolymer of polylactic and polyglycolic acids, originally developed for midfacial rejuvenation procedures[3,4]. The Endotine suspension devices are widely used in cosmetic surgery such as endoscopic midface lift[5], eyebrow suspension[6], and vertical midface lift for the ageing face[7].

We further corrected the remaining lip canting after skeletal leveling during orthognathic surgery in patients with facial asymmetry. We describe four cases of soft tissue lifting procedures using the Endotine device with long-term results.
Case Report

We describe four patients in this report. All patients were male and underwent orthognathic surgery from May 2009 to November 2012 at the Department of Oral and Maxillofacial Surgery, Gangneung-Wonju National University Dental Hospital by one surgeon. In posteroanterior cephalogram and frontal photographs, we examined the hard tissue and soft tissue characteristics of patients with facial asymmetry to determine the factors affecting the recognition of facial asymmetry (Table 1).

After routine orthognathic surgery for correction of the skeletal asymmetry and the transverse occlusal canting, a low-level temporal approach was selected for the tissue tunneling. A 2 cm incision within the hair-line sufficed for the approach. At the initial incision, a crescent-shaped cutaneous tissue was excised for the facelift effect. After making the incision, wide tissue tunneling was performed at the level of the lipocutaneous layer with a long Metzenbaum scissor. The dissection should leave sufficient fat on the dermal surface as well as on the underlying superficial musculoaponeurotic system (SMAS). The dis-

| Patient No.* | Age (yr) | Date of operation | Transverse occlusion plane canting (mm) | Surgical procedures |
|--------------|----------|-------------------|----------------------------------------|--------------------|
| 1            | 32       | 2009-05-12        | 0                                      | BSSRO for mandibular set-back (8 mm) |
|              |          |                   |                                        | Endotine Ribbon† suspension for correction of left-side lip ptosis |
| 2            | 18       | 2010-07-07        | 4                                      | Le Fort I osteotomy for canting correction and posterior impaction (3 mm) |
|              |          |                   |                                        | BSSRO for mandibular set-back (4 mm) |
| 3            | 23       | 2010-07-28        | 5                                      | Endotine Ribbon† suspension for correction of right-side lip ptosis |
|              |          |                   |                                        | Le Fort I osteotomy for canting correction, posterior impaction (2 mm), and maxillary midline correction |
| 4            | 40       | 2012-11-13        | 5                                      | BSSRO for mandibular set-back (7 mm) |
|              |          |                   |                                        | Endotine Ribbon† suspension for correction of left-side lip ptosis |
|              |          |                   |                                        | Le Fort I osteotomy for canting correction |
|              |          |                   |                                        | IVRO (right)/SSRO (left) for mandibular set-back (6 mm) |
|              |          |                   |                                        | Endotine Midface‡ suspension for correction of right-side lip ptosis |

BSSRO, bilateral sagittal splitting osteotomy; IVRO, intraoral vertical ramus osteotomy.
*All patients was male. †Coapt Systems Inc., Palo Alto, CA, USA.

Fig. 1. Additional procedures of soft tissue suspension surgery during two-jaw orthognathic surgery. (A) The Endotine suspension device (Coapt Systems Inc., Palo Alto, CA, USA). The tines are designed to grasp soft tissues. (B) The placement of the suspension device. (C) A 2 cm-sized low-level temporal incision is performed, and the marking for excision of the crescent-shaped cutaneous tissue. (D) Tissue tunneling for the placement of the device. (E) After the platform is in position, the device is suspended to the temporal fascia at its elevated position. (F) The excess leash is removed.
section should continue to just above the mouth corner to assure that the fixation platform of the Endotine device is positioned over the mouth corner. After the Endotine device was inserted to the desired position, we applied digital pressure to engage the tines of the device in SMAS layer. This is a very important surgical step because the cheek is constantly mobile. After removal of the insertion tools, we pulled up the device until the lip canting improved, and we fixed it to the temporal fascia at the elevated position with two 3-0 polydioxanone sutures. We put in layered skin sutures (Fig. 1).

Patients were observed periodically ranging from 18 months to five years. Immediately after the operation, no patients complained of foreign body sensations or discomfort at daily usual activities. No acute or chronic inflammatory complications were noted.

**Discussion**

Most lip canting is considered a secondary characteristic of the craniofacial skeletal cant, but a study reported that 8.7% of adults without occlusal plane cant were found to have a canting of the upper lip[8]. Cho et al.[9] reported that lip-line canting is caused by craniofacial morphology when the change of lip-line canting during smiling is minimal. Conversely, when the lip line cant changes during smiling, it is affected by the right-left difference of zygomaticus major muscular activity and craniofacial morphology. According to Hwang et al.[10], lip canting is present with chin deviation, even without significant maxillary skeletal cant, and in these cases lip canting can be improved esthetically by mandibular surgery alone. Of our patients, patient 1 had severe lip canting without transverse skeletal canting (Fig. 2).

A clinical study suggested that the amount of lip canting change is more related to the canting correction of the anterior maxillary transverse occlusal plane than to the posterior maxillary transverse occlusal plane in patients with Angle’s class III malocclusion, facial asymmetry[11]. Therefore, the causes of lip canting and the surgical management of lip canting are complicated and clinical assessment of lip canting at rest or during function is very delicate.

We found it easy to place the Endotine device and adjust as necessary to achieve the desired soft tissue suspension during the operation. The five tines of the device provide multiple points of contact to grasp soft tissue, giving powerful tissue anchoring. Although sensitive patients may complain of foreign body sensation postoperatively, the device completely dissolves within a year[6].

After orthognathic surgery, facial asymmetry of soft tissue is esthetically improved following skeletal changes[12], and remains stable afterward[13]. However, it is difficult to determine the degree of precise soft tissue change. For the subjective assessment, we assessed the amount of lip canting with the angle between the interpupillary line and the

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**Fig. 2.** Pre-operative (A), 6 months (B), and 3 years post-operative (C) frontal photographs of patient 1.
Table 2. Lip canting changes

| Patient No. | Pre-operative lip canting (°) | Lip canting at 6 months after operation (°) | Lip canting at 3 years after operation (°) |
|-------------|-------------------------------|-------------------------------------------|-------------------------------------------|
| 1           | 5.0                           | 1.5                                       | 1.0                                       |
| 2           | 7.5                           | 4.0                                       | 3.0                                       |
| 3           | 4.0                           | 2.0                                       | 1.5                                       |
| 4           | 6.0                           | 3.0                                       | Needed                                    |

*Degree of lip canting is represented by the angle between the interpupillary line and the line connecting bilateral oral commissure in photograms with resting frontal view.

Fig. 3. Pre-operative (A), 6 months (B), and 3 years post-operative (C) frontal photographs of patient 2.

Fig. 4. Pre-operative (A), 6 months (B), and 3 years post-operative (C) frontal photographs of patient 3.
line connecting bilateral oral commissure in photograms in the resting frontal view, and compared to post-operative measurements (Table 2). Two patients were examined at three years, and their results improved relative to their six month assessments (Fig. 3, 4). Patient 4 also showed acceptable results after the lifting procedure (Fig. 5).

Kim et al.[14] reported the average amount of lip cant correction was 51.5% at six months after bimaxillary orthognathic surgery. In our small group, except for patient 1 who received mandibular surgery alone, the correction rate six months after the operation was 48.9%. Choi et al.[15] reported that correction rate of the lip cant was approximately 76.8% six months after simultaneous orthognathic surgery and the Endotine lift. In this study, the correction rate of the lip cant was 54.2% six months after the operation, and an average 74.2% three years after the operation. Larger sample studies will be needed.

From these case reports, it is difficult to say that the Endotine device induced the additional effect in the correction of the lip canting on the effect of two-jaw orthognathic surgery. It is clear that as time passed, the effect of the Endotine suspension procedure increased without relapse. Probably as the device degraded, it induces some degree of fibrosis in soft tissues around it, a possibility that needs scientific confirmation.

In conclusion, the Endotine device provided lip canting correction with simple and safe surgical procedures. This study demonstrates that the Endotine device may be a good surgical option for patients with facial asymmetry and/or lip canting without long-term relapse. The author suggests that the Endotine device provides reconstructive opportunities for patients with soft tissue ptosis due to facial nerve injury, post-traumatic facial deformity as well as facial asymmetry.

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Young-Wook Park: Correction of Lip Canting Using Bioabsorbables during Orthognathic Surgery

Vol. 36 No. 4, July 2014

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