

# Angle-Splitting Ostectomy Followed by Face Lift for Elderly Patients with Prominent Mandibular Angles

Takashi Nagase, M.D., Kotaro Yoshimura, M.D., Emiko Aiba, M.D., Daisuke Matsumoto, M.D., Katsujiro Sato, M.D., and Chiaki Machino, M.D.

Tokyo, Japan

A prominent mandibular angle is a relatively common aesthetic problem among Asians, and the reduction angle-splitting ostectomy is now becoming a very popular procedure in Asian countries. Although this operation is usually performed on young patients, the same aesthetic demands are also seen in the elderly. In this report, the authors describe their experience with angle-splitting ostectomies followed by face lifts in three patients older than 50 years. The angle-splitting procedure was the same as that performed in young patients, and clinical results were assessed with photographs and three-dimensional computed tomographic scans. The facial contours after angle-splitting ostectomy were satisfactory, but the patients showed postoperative redundancy of the skin, especially along the jaw line, because of the loss of bony protrusion laterally. Therefore, the patients underwent subsequent superficial musculoaponeurotic system cheek lifts. The final aesthetic results were satisfactory in all cases. When surgeons want to perform the angle-splitting ostectomy safely and effectively on the elderly, they should be aware of the risks and indications specific for elderly patients, and a multidisciplinary support system should be available. Subsequent face lifts can improve skin redundancy and lead to better cosmetic results. (*Plast. Reconstr. Surg.* 115: 633, 2005.)

A prominent mandibular angle is a relatively common aesthetic problem among Asians, and the reduction angle-splitting ostectomy is now becoming a very popular procedure in Asian countries.<sup>1-3</sup> As reported previously, most patients who undergo reduction mandibuloplasty are young, and elderly patients are rare.

It is of note that aesthetic problems related to a prominent mandibular angle are twofold in the elderly. One is the same as in younger patients: broadness of the lower face with an angular contour that gives a strong impression, which is undesirable in most Asian women. This type of aesthetic demand is seen in elderly and younger patients. Another point is more specific to the elderly: it is difficult to achieve excellent face lift results in elderly patients with a prominent mandibular angle. Prominence of the mandible disturbs the smooth excursion of lifting skin in the dissected cheek, and this problem is frequently and specifically encountered in Asians.<sup>4</sup> In these contexts, reduction ostectomy of the mandibular angle for the elderly is justified, although most previous publications have mentioned only younger patients.

In the past 2 years, we performed angle-splitting ostectomies on three Japanese patients older than 50 years, and they also underwent rhytidectomies afterward. Some special considerations should be required so that this operation can be safely and effectively performed in elderly patients. In this article, we describe our experience in detail and discuss

From the Department of Plastic Surgery, University of Tokyo, Graduate School of Medicine. Received for publication February 20, 2004; revised May 18, 2004.

DOI: 10.1097/01.PRS.0000150155.56974.79

some features of this operation specific for the elderly cases.

## PATIENTS AND METHODS

### Patients

In the past 2 years, we performed angle-splitting osteotomies on three Japanese patients older than 50 years (Table I). All of the patients had this operation for purely cosmetic purposes, and none had specific craniofacial anomalies. They underwent cheek lifts several months later. None had simultaneous osteotomy and rhytidectomy. We found no particular risks for general anesthesia in these patients in preoperative examinations, and all patients underwent surgery under general anesthesia. We routinely suggested patients give 400 ml of their own blood at the time of preoperative examination for autotransfusion, and two of three patients did so.

### Operative Procedures

The operations were performed mostly according to previous publications by Deguchi et al.<sup>2</sup> and Han and Kim,<sup>3</sup> with slight modifications. In brief, the oral mucosa was incised along the mandibular ramus, from the point just beside the parotid papilla to the first molar. The lateral surface of the mandibular angle was exposed by subperiosteal dissection. The caudal end of the masseter muscle was carefully released from the mandible, but we did not cut or resect the muscle belly. A deep groove was hollowed out on the lateral cortex using a round burr, along the upper and anterior boundary of the osteotomized area (Fig. 1, *left*). Several perforations were made using a Lindemann drill burr (Downs Surgical, Sheffield, United Kingdom) from this groove toward the posterior and inferior margins of the mandible, in parallel with and just under the lateral cortex, to avoid any unexpected fracture (Fig. 1, *center*). Then, the lateral cortex of the angular bone was osteotomized with a bone chisel. If necessary, the tip of the angle was

additionally excised with an oscillating saw (Fig. 1, *right*). The released end of the masseter muscle was left detached. Finally, a Penrose drain was inserted, the oral mucosa was closed with absorbable 4-0 sutures, and a pressure mask was applied and left overnight. The Penrose drains were removed a few days later.

## RESULTS

The angle-splitting osteotomy was performed successfully in all cases. The average operation time was approximately 2 hours 10 minutes. The average amount of hemorrhage was approximately 350 ml, and the two patients who gave their own blood preoperatively underwent autotransfusion just before the end of the operation. No patients required blood transfusions from other persons. No unexpected fractures of the mandible body, ramus, or condyle occurred.

Postoperative recovery was uneventful, and no patients exhibited circulatory or respiratory problems. No hematomas or local infections were observed. Transient unilateral sensory disturbance of the skin in the mental nerve area was observed in two cases, and slight paralysis of the marginal mandibular branch of the facial nerve was seen for a few days in one case. Skeletal contours of the lower face were significantly changed, and final outcomes after the face lift operations were quite satisfactory in all cases.

## CASE REPORTS

### Case 1

A 55-year-old woman sought treatment for a prominent mandibular angle (Fig. 2, *left*). She had had a constant complaint about the shape of her mandible since she was a teenager. She also wished to undergo a face lift. She had no special history of past illness. Radiographs and three-dimensional computed tomographic scans showed remarkable protrusion and lateral flaring of the mandibular angle (Fig. 3, *left*). The angle-splitting osteotomy was performed under general anesthesia, and 5 × 2.5-cm fragments of the lateral cortex were removed bilaterally. Postoperative radiographs and three-dimensional computed tomographic scans showed significant reduction of the lateral cortex (Fig. 3, *right*). Her facial con-

TABLE I  
Patient Profiles

Case	Age (yr)	Sex	Operation Time	Bleeding (ml)	Autologous Blood Transfusion	Intraoperative Nerve Injury	Subsequent Face Lift	Follow-Up
1	55	F	2 hr 25 min	400	+	-	+	1 yr 11 mo
2	65	F	1 hr 55 min	100	-	-	+	1 yr 2 mo
3	51	F	2 hr 15 min	560	+	-	+	8 mo

F, Female.

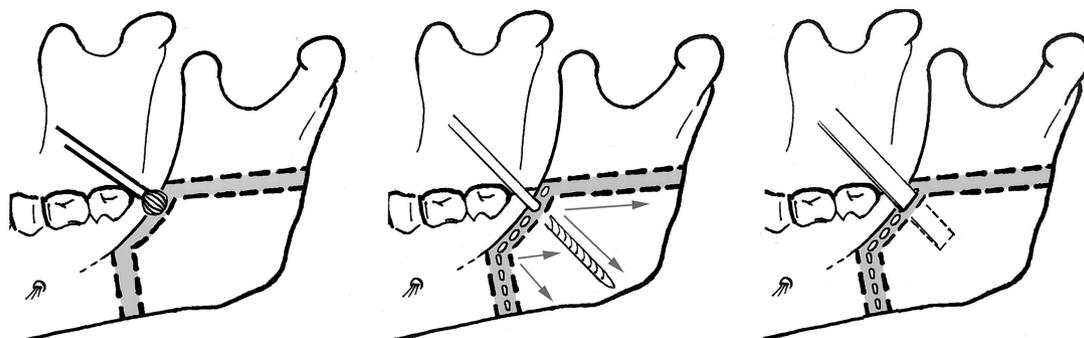


FIG. 1. Illustrations of the operative procedures. (Left) A deep groove is made along the shaded area (upper and anterior boundary of the osteotomy), using a round burr. (Center) Several perforations are made using a Lindemann drill burr from this groove in various directions (arrows). (Right) The lateral cortex of the angular bone is osteotomized with a bone chisel. The tip of the angle is excised with an oscillating saw, if necessary.

tour was changed remarkably 2 months after the osteotomy, but some skin redundancy was obvious along the jaw line (Fig. 2, center).

A rhytidectomy with radical superficial musculoaponeurotic system (SMAS) lift was performed 3 months after the osteotomy. The lifting was very effective at reducing redundancy of the skin in the mandibular area (Fig. 2, right). No specific problems were observed except slight and transient sensory disturbance in her left lower lip. The patient was very satisfied with the final result.

### Case 2

A 65-year-old woman was referred to us for treatment for her facial contour (Fig. 4, left). She had been unhappy with her angled face and low nose since childhood. She had a history of asthma but had had no attacks in the past 10 years. A preoperative spirogram showed no problems, and she underwent angle-splitting osteotomy under general anesthesia. The angled contour was improved, but the upper part of the angle was not completely resected (Fig. 4, center). Seven months later, we performed an SMAS face lift and insertion of silicone implants into her nasal dorsum. A correction of the mandibular angle was simultaneously performed through the face lift incision with great care not to damage the marginal mandibular branch of the facial nerve. The final result was very satisfactory (Fig. 4, right).

### Case 3

A 51-year-old housewife had a complaint about her prominent zygoma and mandible (Fig. 5, left). She had undergone a resection of the uterus myoma several years previously but had no other particular history. In this case, the lateral flaring was not so remarkable, but the whole mandibular angle was hypertrophic on the preoperative three-dimensional computed tomographic scan (Fig. 6, left). She underwent angle-splitting osteotomy under general anesthesia. Postoperative recovery was uneventful. An SMAS lift was performed 5 months later, and the postoperative contour was markedly improved (Fig. 5, right, and Fig. 6, right).

## DISCUSSION

There have been a number of reports on surgical methods for angular faces. This condi-

tion was historically called "benign masseteric hypertrophy," and resection of the masseter muscle and bone was originally regarded as essential.<sup>5,6</sup> However, the angled appearance of the face in Asians can be primarily attributed to a lateral flaring of the bony angle.<sup>7</sup> Because the masseter muscle always exhibits tetanic contraction, as do the calf muscles, it can be atrophied only by inducing temporary paralysis with botulinum toxin,<sup>8</sup> and also by releasing the end of the muscle.<sup>3</sup> Therefore, it is suggested that muscle resection is unnecessary, and that the mandibular angle osteotomy alone can be the primary procedure for this condition. There have been several reports of a simple full-thickness excision of the bony angle for correcting this condition.<sup>1,7,9</sup> However, this procedure may often be accompanied by an unnecessary change of sella-to-nasion/mandibular plane angle. Thus, we believe that a lateral cortical reduction by angle-splitting osteotomy accompanied by release of the masseter muscle end can lead to sufficient reduction of the width of the lower face without losing the natural contour of the mandibular angle.

After an angle-splitting osteotomy, elderly patients show postoperative redundancy of the skin, especially along the jaw line because of the loss of bony protrusion laterally. Therefore, a subsequent SMAS cheek lift is preferable, and the final results after the rhytidectomy were successful in our cases. It has been pointed out that rhytidectomy in Asians requires special considerations because the facial skeletal contour in Asians is round and squared, as Shirakabe et al. described in the "baby model" paradigm.<sup>4,10</sup> Asian skin is thicker than that of whites with abundant extracellular

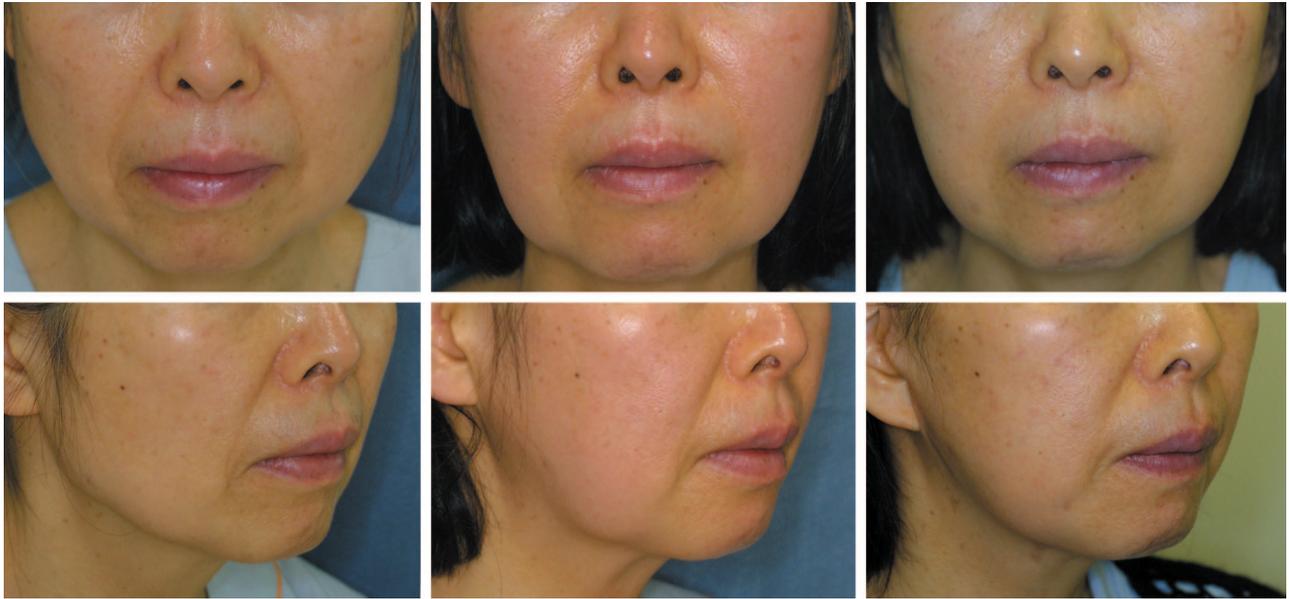


FIG. 2. The patient in case 1, a 55-year-old woman. (Left) Preoperative views. (Center) Views 2 months after the osteotomy. (Right) Views 2 months after the SMAS lift.

matrices,<sup>10</sup> and this fact also contributes to the difficulty of Asian rhytidectomies. A correction of the angular skeletal contours with an angle-splitting osteotomy can be taken into consideration and combined with the face lift procedure in Asians with protruding angles.

In a combination of angle osteotomy and rhytidectomy, the osteotomy should definitely be performed beforehand. Baek et al.<sup>7</sup> reported a simultaneous combination of angle osteotomy and rhytidectomy in several patients. However, we believe that two-stage operations are better, with an interval of several months for the following reasons: one is to avoid lengthy operation time. Delicate adjustment of the bony angle shape can be achieved in the second operation through a face lift incision as seen in case 2—another advantage of our two-stage strategy. We consider the most important reason to be that sufficient lifting is likely impossible in the one-stage operation because of intraoperative swelling caused by the preceding osteotomy.

Several problems should be borne in mind when the angle-splitting osteotomy is performed on the elderly. Most important is atrophy of the mandible, which we experienced in another patient that underwent angle-splitting alone, now awaiting a rhytidectomy (Fig. 7). In this case, the inferior alveolar nerve was damaged during the splitting osteotomy partly because of the atrophy of the mandibular bone.

The nerve was repaired with 8-0 nylon sutures and fibrin glue. As stated by Moss and Salentijn<sup>11</sup> in their “functional matrix” concept, craniofacial bone remodeling is mainly controlled by external mechanical stresses. The edentulous mandible in the elderly often exhibits remarkable atrophy, mainly in the alveolus by the loss of stress through the teeth.<sup>12</sup> In this case, the bilateral molars and premolars were missing and the preoperative three-dimensional computed tomographic scan revealed atrophy and thinness around the mandibular angle (Fig. 7, *above* and *center*). However, we can also detect in this computed tomographic scan a remarkable lateral flaring of the angle, which causes it to be prominent (Fig. 7, *above* and *below*). The mechanisms by which the functional matrix work are completely different between the alveolus and the lateral flaring of the angle because the bone deposition in the lateral cortex of the mandibular angle is considered to be affected by the tension of the masseter muscle.<sup>13</sup> This is the reason why a prominent mandibular angle can be observed even in the edentulous atrophic mandible. We can treat such cases with reduction mandibuloplasty, but special care should be taken not to damage the inferior alveolar nerve and to avoid malfractures. It is reported that the mandibular canal remains intact around the angle, even in the completely edentulous mandible,<sup>12</sup> and this fact supports our

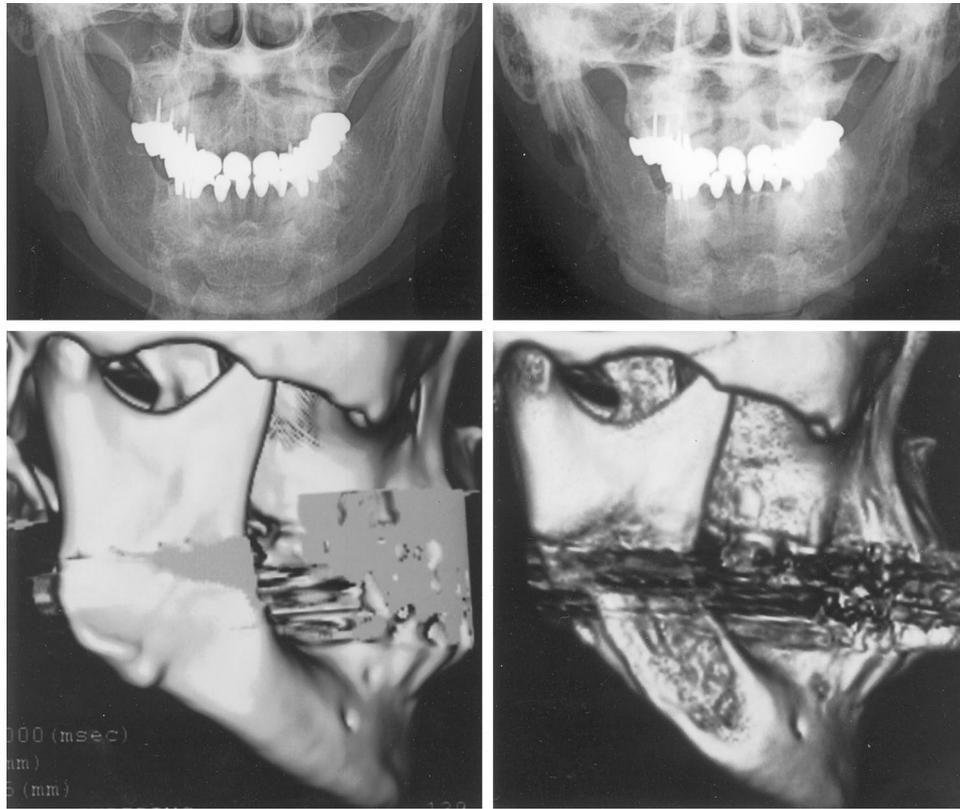


FIG. 3. The patient in case 1, a 55-year-old woman. (Above, left) Preoperative frontal cephalogram shows remarkable lateral flaring of the mandibular angle. (Above, right) Postostectomy cephalogram. (Below, left) Preoperative three-dimensional computed tomographic scan. (Below, right) Postostectomy three-dimensional computed tomographic scan reveals a successful reduction of the angle.

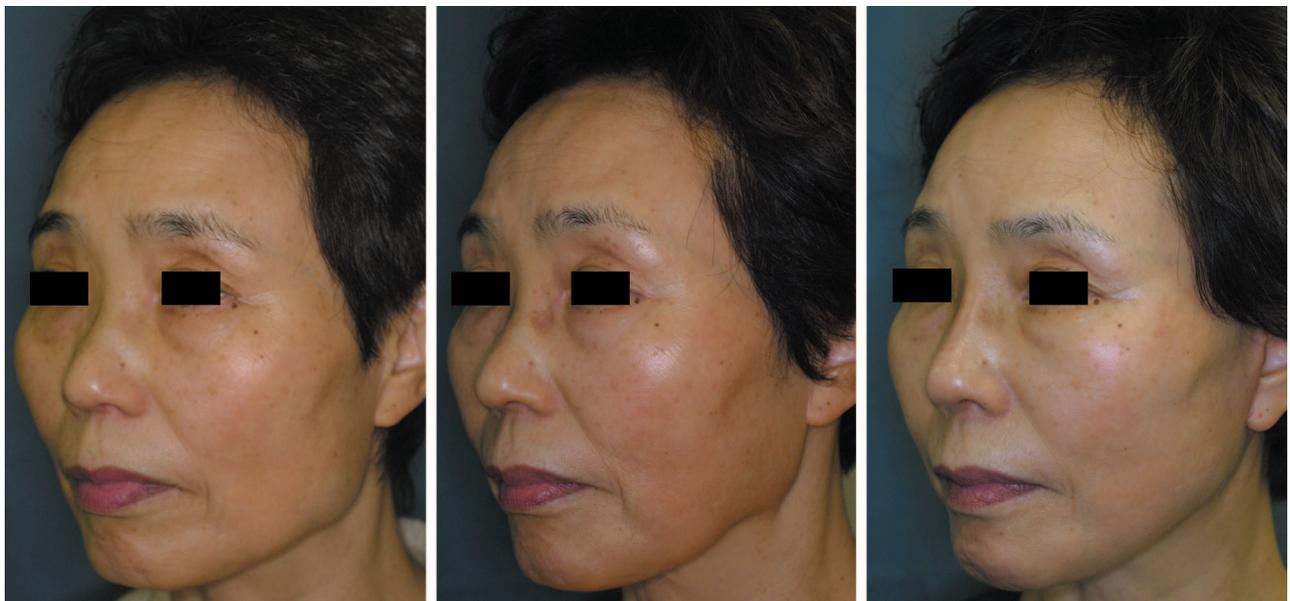


FIG. 4. The patient in case 2, a 65-year-old woman. (Left) Preoperative appearance. (Center) Appearance after the angle-splitting osteotomy. Some protrusion is left in the angle. (Right) Final appearance, 1 year after the osteotomy and 5 months after the SMAS lift. The angle shape was adjusted through the face lift incision. She also underwent augmentation of the nose at the secondary operation.



FIG. 5. The patient in case 3, a 51-year-old woman. (*Left*) Preoperative views. (*Right*) Postoperative views, 8 months after the osteotomy and 3 months after the SMAS lift.

opinion that angle-splitting can be safely performed if the surgeons are well acquainted with the specific features of mandibular atrophy in elderly patients. Preoperative three-dimensional computed tomographic scans may be quite informative for this purpose.

Other potentially unfavorable outcomes of the angle-splitting osteotomy include asymmetry of the corticotomy as seen in case 1 (Fig. 3, *above, right*). Although it is less evident in the facial photograph and clinically acceptable in this case, preoperative or intraoperative pre-

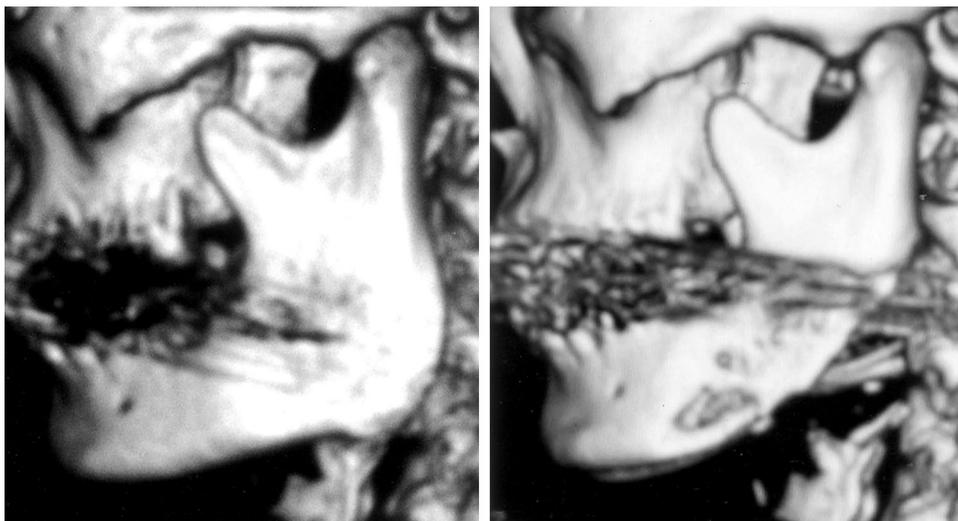


FIG. 6. The patient in case 3, a 51-year-old woman. (*Left*) Preoperative three-dimensional computed tomographic scan reveals remarkable hypertrophic angle of the mandible. (*Right*) Postoperative three-dimensional computed tomographic scan shows that the osteotomy was effective.

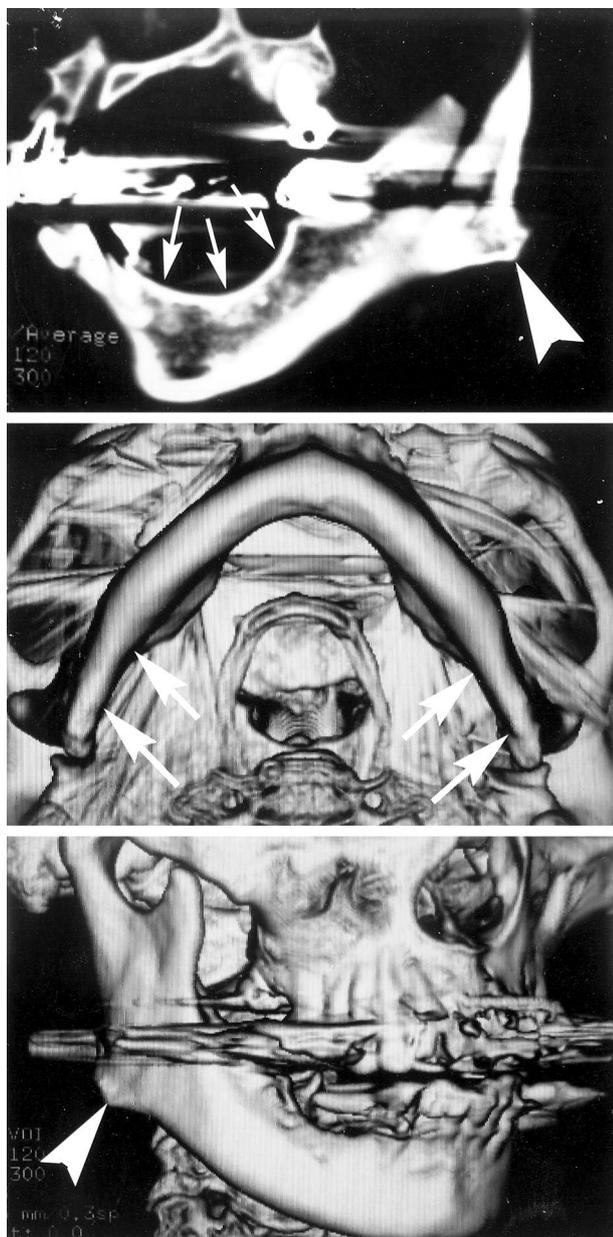


FIG. 7. Computed tomographic scans of the edentulous mandible of a 69-year-old woman. (Above) Computed tomographic scan of the oblique plane of the left mandibular angle. Note the lateral flaring of the angle (arrowhead) even though the mandibular body shows remarkable atrophy (arrows) resulting from the extraction of the molars and premolars. (Center) A caudal view of the mandible by three-dimensional computed tomographic scan shows atrophy around the angle (arrows). (Below) An oblique view of the mandibular angle by three-dimensional computed tomographic scan. The lateral flaring is obviously noted (arrowhead).

cise assessment of the amount of bone resection is essential to avoid this problem. We also encountered a relatively large amount of hemorrhage from the facial artery in case 3. This risk can be minimized by preparation of the

autologous blood transfusion. Collaboration with anesthesiologists is also essential for avoiding general risks potentially serious in the elderly, and with their help, we did not experience any circulatory or respiratory troubles preoperatively or postoperatively.

#### CONCLUSIONS

The angle-splitting osteotomy for prominent mandibular angles is worth performing even in the elderly, and subsequent cheek lifting is recommended to achieve excellent contours of the lower face. Also, the surgeon should be well acquainted with the specific surgical risks, and a multidisciplinary support system should be available when the angle-splitting osteotomy is planned for the elderly.

Kotaro Yoshimura, M.D.  
 Department of Plastic Surgery  
 University of Tokyo Graduate School of Medicine  
 7-3-1 Hongo, Bunkyo-ku  
 Tokyo 113-8655, Japan  
 yoshimura@cosmetic-medicine.jp

#### REFERENCES

1. Baek, S. M., Kim, S. S., and Bindiger, A. The prominent mandibular angle: Preoperative management, operative technique, and results in 42 patients. *Plast. Reconstr. Surg.* 83: 272, 1989.
2. Deguchi, M., Iio, Y., Kobayashi, K., and Shirakabe, T. Angle-splitting osteotomy for reducing the width of the lower face. *Plast. Reconstr. Surg.* 99: 1831, 1997.
3. Han, K., and Kim, J. Reduction mandibuloplasty: Osteotomy of the lateral cortex around the mandibular angle. *J. Craniofac. Surg.* 12: 314, 2001.
4. Shirakabe, Y. The Oriental aging face: An evaluation of a decade of experience with the triangular SMAS flap technique in facelifting. *Aesthetic Plast. Surg.* 12: 25, 1988.
5. Adams, W. Bilateral hypertrophy of the masseter muscle: An operation for correction (case report). *Br. J. Plast. Surg.* 2: 78, 1949.
6. Ousterhout, D. K. Mandibular width reduction including the surgical treatment of benign masseteric hypertrophy. In D. K. Ousterhout (Ed.), *Aesthetic Contouring of the Craniofacial Skeleton*. Boston: Little, Brown, 1991. P. 451.
7. Baek, S. M., Baek, R. M., and Shin, M. S. Refinement in aesthetic contouring of the prominent mandibular angle. *Aesthetic Plast. Surg.* 18: 283, 1994.
8. Lindern, J. J., Niederhagen, B., Appel, T., Berge, S., and Reich, R. H. Type A botulinum toxin for the treatment of hypertrophy of the masseter and temporal muscles: An alternative treatment. *Plast. Reconstr. Surg.* 107: 327, 2001.
9. Yang, D. B., and Park, C. G. Mandibular contouring surgery for purely aesthetic reasons. *Aesthetic Plast. Surg.* 15: 53, 1991.

10. Shirakabe, Y., Suzuki, Y., and Lam, S. M. A new paradigm for the aging Asian face. *Aesthetic Plast. Surg.* 27: 397, 2003.
11. Moss, M. L., and Salentijn, L. The primary role of functional matrices in facial growth. *Am. J. Orthod.* 55: 566, 1969.
12. Polland, K. E., Munro, S., Reford, G., et al. The mandibular canal of the edentulous jaw. *Clin. Anat.* 14: 445, 2001.
13. Cutting, C. B., McCarthy, J., G., and Knize, D. M. Repair and grafting of bone. In J. G. McCarthy (Ed.), *Plastic Surgery*, Vol. 1. Philadelphia: Saunders, 1990. P. 583.