

# Incidence of Complications Associated with Mandibuloplasty: A Review of 588 Cases over 5 Years

Minbum Kang, MD

**Background:** The number of patients undergoing mandibuloplasty in East Asia has increased in recent years. Angle resection, corticectomy, and tubercle excisions are the most commonly used methods of mandibuloplasty. However, no data are available on complications following mandibuloplasty. This study aimed to determine the prevalence and significance of intra- and postoperative complications associated with mandibuloplasty.

**Methods:** A total of 588 Korean patients (99 men, 489 women; age range, 19–62 years) who underwent mandibuloplasty (performed by a single surgeon in the same clinic) were divided into 4 groups: group I, angle resection (190); group II, angle resection and genioplasty, including tubercle excision (130); group III, angle resection and zygoma reduction (114); and group IV, angle resection, genioplasty, and zygoma reduction (154). The average follow-up period was 14 weeks.

**Results:** The most common complication was numbness. Of 38 patients (6.46%) with sensory deficits, 16 (2.72%), 11 (1.87%), and 11 (1.87%) patients reported these changes around the chin, lower lip, and intraoral incision areas at postoperative 6 months and 3, 1, and 5 patients reported these changes at postoperative 1 year, respectively. Infection occurred in 19 patients (3.23%) within 2 weeks and was resolved with IV antibiotics in 1–2 weeks in 17 patients but was unresolved in 2 after 3 months. Hemifacial palsy, intraoperative bleeding requiring transfusion, and hardness and burning sensation were also noted in 1 patient.

**Conclusions:** Surgeons must be aware of the complications of mandibuloplasty and their occurrence rates. (*Plast Reconstr Surg Glob Open* 2014;2:e139; doi: 10.1097/GOX.0000000000000090; Published online 30 April 2014.)

In East Asia, a square-shaped face is considered unattractive as it gives the impression of a strong and stubborn personality. Many contouring sur-

geries for the mandible, including mandibular angle ostectomy, corticectomy, and mandibular tubercle resection, are performed for this reason.<sup>1–4</sup> Several articles on complications after orthognathic surgery have been published; however, most of these are on bilateral sagittal split ramus osteotomy or vertical ramus osteotomy.

Although mandibular surgery is not associated with nerve damage, many patients have reported sensory

From the Division of Plastic and Reconstructive surgery, Romian Plastic Surgery Clinic, Seoul, Republic of Korea.

Received for publication December 12, 2014; accepted March 3, 2014.

Copyright © 2014 The Authors. Published by Lippincott Williams & Wilkins on behalf of The American Society of Plastic Surgeons. *PRSGO* is a publication of the American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 3.0 License, where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially.

DOI: 10.1097/GOX.0000000000000090

**Disclosure:** The author has no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the author.

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

changes and infection after the surgery. Therefore, the author divided patients who underwent mandibuloplasty into 4 groups. Data on postoperative symptoms were collected from the patients' charts and divided according to type and duration. The most common complication was numbness around the chin, lower lip, and intraoral areas, followed by infection.

### PATIENTS AND METHODS

From January 2007 to December 2012, 588 Korean patients (99 men, 489 women; age range, 19–62 years) underwent mandibular angle ostectomy (Table 1). All patients provided informed consent for the publication of this article. The patients were divided into 4 groups based on the type of surgery: group I, angle resection (190); group II, angle resection and genioplasty, including tubercle excision (130); group III, angle resection and zygoma reduction (114); and group IV, angle resection, genioplasty, and zygoma reduction (154) (Table 2). Follow-up was continued until the patient reported satisfaction and had no complaints or discomfort. The average follow-up period was 14 weeks. Groups II and IV included patients who had undergone sliding genioplasty. Because all patients had normal occlusion, there was no secondary case. Before the surgery, each patient was consulted with regard to his/her concerns and wishes, and a comprehensive surgical plan was discussed based on patient input. Frontal, profile, and lateral view photographs and radiographs were obtained, including a mandible series, a lateral cephalogram, and a standard panoramic view. Surgical plans were developed and established based on an evaluation of these radiographs and photographs. The surgeries

were performed under general anesthesia (See **Video 1, Supplemental Digital Content 1**, which displays a mandibuloplasty procedure with tubercle excision for chin narrowing, mucosal incision, burring of mandible outer cortex, design for resection, angle resection with oscillating saw blade, corticectomy, chin mucosal incision, periosteal elevation, and tubercle resection, available in the “Related Videos” section of the Full-Text article on PRSGO.com or, for Ovid users, available at <http://links.lww.com/PRSGO/A29>). An incision was made in the bilateral angular area with a blade in the conventional manner. After exposure of the bare mandibular angle, cortex burring was performed; a line design was drawn with a pencil to guide the actual bone cutting. With an oscillating saw blade, angle resection was performed. More incisions were made from the central vestibule to the canine with a blade; the lower lip frenulum was saved by making a V-shaped incision, which is important to prevent scars. The muscular attachment was then stripped off, while preserving as much muscle fiber and soft tissue around the mental foramen as possible (Fig. 1). Initially, the central chin point and the planned chin width were marked (usually, in women, chin width is determined to be the distance between the lateral portions of the 2 lateral incisors, but in men, this width is wider). After tunneling between the midline and angular approaches, both mental tubercles were removed. A reciprocating straight saw was passed from the inferior portion of the mental foramen to the parasymphyseal area. Finally, sliding genioplasty was performed if needed. In groups III and IV, zygoma reduction was included. With an in-

**Table 1. Classification of Patients Based on Age and Gender**

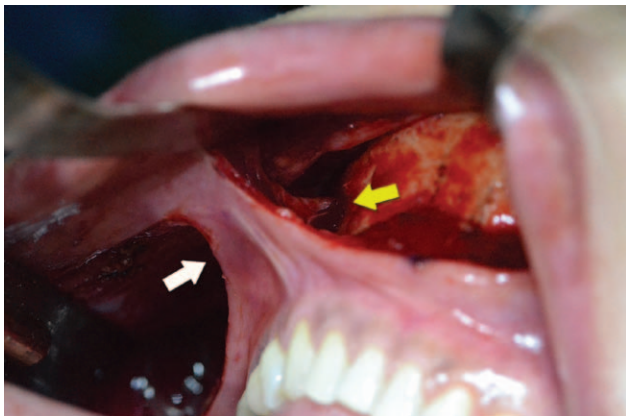
Age	Gender	
	Male	Female
<20	2 (0.34%)	12 (2.0%)
21–30	48 (8.16%)	265 (45%)
31–40	41 (6.97%)	159 (27%)
41–50	8 (1.36%)	48 (8.16%)
51–60	0	4 (0.68%)
>61	0	1 (0.17%)
588	99 (16.84%)	489 (83.16%)

**Table 2. Patient Groups with Type of Surgery**

Group I	Angle resection (with or without corticectomy)	190 (32.3%)
Group II	Angle resection + tubercle excision (with or without sliding genioplasty)	130 (22.1%)
Group III	Group I + zygoma reduction	114 (19.4%)
Group IV	Group II + zygoma reduction	154 (26.2%)



**Video 1.** This video displays a mandibuloplasty procedure with tubercle excision for chin narrowing, mucosal incision, burring of mandible outer cortex, design for resection, angle resection with oscillating saw blade, corticectomy, chin mucosal incision, periosteal elevation, and tubercle resection. Available in the “Related Videos” section of the Full-Text article on PRSGO.com or, for Ovid users, available at <http://links.lww.com/PRSGO/A29>.



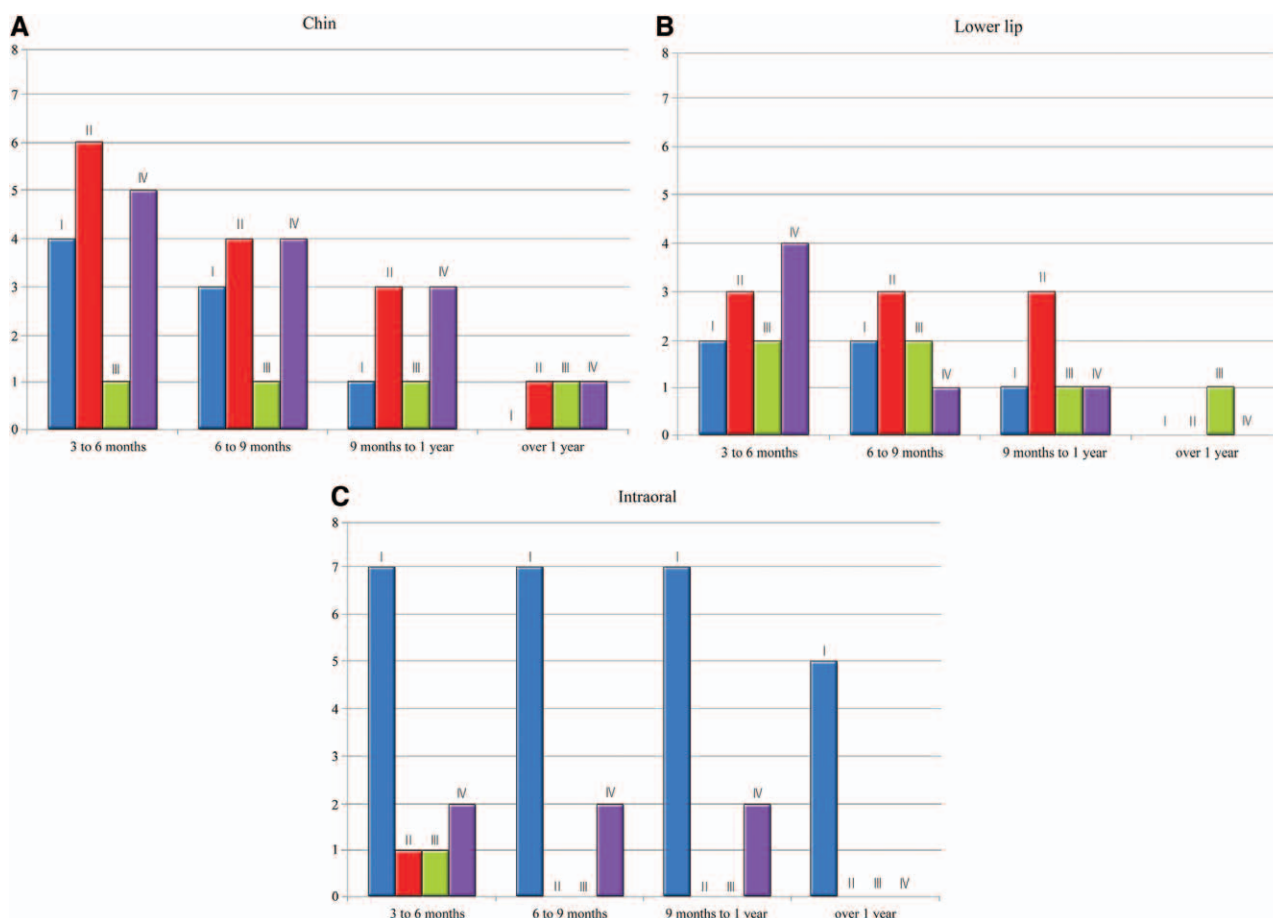
**Fig. 1.** After mandible resection, mucosal and muscle pedicle (white arrow) is elevated to protect mental nerve (yellow arrow) during tubercle excision.

traoral and a preauricular incision, L-shaped bone removal and fixation with miniplates and screws were performed. After cold saline irrigation and meticu-

lous bleeding control, the incision was sutured, and bulky compressive dressing was maintained for 4–5 days. During the surgery, the main nerve trunk was checked to confirm that there had been no damage. All patients were admitted to the clinic for 1–2 days. The first dose of antibiotic was administered during the surgery, and subsequent doses were given every 8 hours for 2 more days.

### RESULTS

All patients were satisfied with the cosmetic results of the procedure. According to the data, sensory deficit around the chin, lower lip, and intraoral areas was the most common complication. Of these areas, the chin was the most common area involved (2.72%) (Fig. 2). Sensory loss of the lower lip and intraoral areas occurred at the same rate (1.87%) (Fig. 2). There were 29 cases (4.93%) with this involvement over 6 months after surgery, and 9 (1.53%) of these had not resolved in 1 year after the surgery. Eight pa-



**Fig. 2.** Number of patients with sensory deficit in each period after mandibuloplasty. Group I is angle resection with or without corticectomy. Group II is angle resection and tubercle excision with or without sliding genioplasty. Group III is angle resection and zygoma reduction together. Group IV is angle resection, tubercle excision, and zygoma reduction. The period is divided into 4: 3–6 months, 6–9 months, 9 months to 1 year, and more than 1 year. A, Chin area. B, Lower lip area. C, Intraoral area.

tients (1.36%) wanted the plate and screws used for fixation of the bone segment in sliding genioplasty to be removed. They reported improved movement and sensation after plate and screw removal. Differences were noted in sensory deficit among the groups. In group II and group IV patients, who had undergone genioplasty, the sensory deficit was greater in the chin and lower lip areas. The other complication was infection. It occurred within 2 weeks in 19 patients (3.23%) (Table 3), usually with immediate swelling and tenderness in the mandible area. Before oral wound closure, the pus and discharge were drained every day, and IV antibiotics were administered for 1 week. Almost all infections occurred within 5 months, and 2 of these developed into a chronic infection. The patients were receiving IV antibiotics for more than 3 months. However, one of these infections occurred 6 months after surgery, and the patient had a recurrent mass and swelling. One patient required transfusion during the surgery and another had hemifacial palsy, from which she recovered completely after 6 months.

### DISCUSSION

In East Asia, mandible reduction procedures are commonly performed to alter the masculine appearance of a face into a more feminine one. Baek et al<sup>1</sup> first used the term “prominent mandibular angle” and described the use of angular resection. Following this, surgeons introduced a number of techniques for improving the frontal facial contour, including shaving of the lateral cortex, sagittal splitting osteotomy, and lateral corticectomy.<sup>1-6</sup> Currently, there is a consensus regarding mandible-contouring surgery that includes angle osteotomy and lateral cortex excision or shaving. In addition, the importance of lower chin contour has been emphasized, and several techniques such as tubercle excision and narrowing genioplasty have been added.<sup>4</sup> However, surgeons do not have much information about the complications of mandibular reduction. Several articles on complications after mandible surgery have been published, but most of these are on bilateral sagittal split ramus osteotomy or vertical ramus osteotomy, and furthermore, the surgeries were performed by multiple doctors at different clinics.

Therefore, the author gathered data on complications after classifying the mandible reductions. A

retrospective study was conducted with a chart review of all the patients. Sensory deficit in the chin, lower lip, and intraoral areas that innervate from inferior alveolar nerve (38 cases: 6.46%) was found to be the most common complication. Another common complication was infection seen in 35 patients (5.95%).

### Nerve Injuries

Most of the articles published on orthognathic surgery complications have reported nerve injury as one of the most common complications.<sup>7-9</sup>

The frequency of neurosensory deficit occurrence after orthognathic surgery ranges from 8% to 32%.<sup>10-15</sup> Nevertheless, this is a temporary event, which is generally recovered in 6 to 12 months after surgery.<sup>12</sup> Thirty-eight cases (6.46%) showed sensory deficit, which was classified into 3 regions: chin, lower lip, and intraoral areas (Fig. 2). Nine patients (1.53%) reported sensory deficit for more than a year following the surgery. The occurrence of paresthesia may decrease the patient’s overall satisfaction with the surgical outcome.<sup>13</sup> Neurosensory deficit is perceived by the patients as paresthesia or as reduced sensitivity over the anatomical region innervated by the inferior alveolar nerve. Kenju et al<sup>14</sup> reported that alveolar nerve lesions are usually caused by direct or indirect mechanical traumatic events. Furthermore, additional damage might occur from inflammatory phenomena, bleeding, and/or hematomas surrounding the mandibular canal. To minimize nerve injury occurrence, a surgeon should keep the panoramic view of the nerve canal in mind and perform a careful dissection of the periosteum and cutting of the bone. Some articles have indicated that occurrence of numbness is also related to the patient’s age at the time of surgery.<sup>10</sup> One of the patients who underwent a foreign body injection in the chin area complained of a painful sensation and uneven skin surface because of incomplete removal.

### Infection

The infection rate differs depending on the surgical environment, antibiotic injections (prophylactic antibiotics and duration), personal oral hygiene, age, and the duration and extent of the surgery. These have been identified as possible factors affecting the prevalence of postoperative infection after orthognathic surgery.<sup>15</sup>

**Table 3. Wound Discharge and Infection**

Group	<2 Weeks	2-3 Weeks	3 Weeks-1 Month	1-2 Months	2-3 Months	3-6 Months	>6 Months	
I	5	4	1	0	2	1	0	13 (2.21%)
II	2	0	2	1	1	0	0	6 (1.02%)
III	5	0	1	0	0	0	1	7 (1.19%)
IV	7	0	2	0	0	0	0	9 (1.53%)
	19 (3.23%)	4 (0.68%)	6 (1.02%)	1 (0.17%)	3 (0.51%)	1 (0.17%)	1 (0.17%)	35 (5.95%)

Chow et al<sup>15</sup> reported differences in infection rates due to age, gender, and factors related to the surgical procedure. He also reported the infection rate in 2 days after penicillin injection to be 5.1%, which was similar to the findings of this study. Infection in the immediate and delayed periods was noted in 5.95% of the cases. All patients received postoperative antibiotic therapy consisting of ceftriaxone, or ciprofloxacin for the patients allergic to the former, to prevent infection. The first dose of antibiotics was administered during surgery, and the subsequent doses were administered every 8 hours for the next 2 days. Infection occurred in 3.23% of the patients within 2 weeks, with serous discharge, pain, and swelling. Infected patients usually showed the following signs and symptoms: localized pain, swelling, surface erythema, pus formation, limited motion, fever, lymphadenopathy, malaise, a toxic appearance, and an elevated white blood cell count.<sup>10</sup> When infection and drainage within the oral wound were detected, a compressive dressing with elastic tape and antibiotic injection were applied and kept for 7 days. In 1 case, the infection had not been resolved 4 months after the surgery; this patient was treated with daily injections of antibiotics until healing was complete and no other complications were present.

#### Other Complications

All patients were satisfied with the cosmetic results of the surgical procedure. Intraoperative bleeding was the other major complication. One patient required intraoperative transfusion; wound compression and electrocautery resolved the complication. The facial artery can tear during dissection or osteotomy of the mandibular margin; this can be avoided by limiting the placement of the instrument to the lower margin of the periosteum. After periosteal dissection, the author applied gauze packing to protect the soft tissue around the mandible. Management of intraoperative hemorrhage requires visualization of the problem area; this may involve rapid completion of an osteotomy to allow application of direct pressure with gauze packing, vascular clips, or electrocautery.<sup>10</sup>

The internal maxillary artery is vulnerable during orthognathic surgery, and embolization is used as a last measure.<sup>13</sup>

#### CONCLUSIONS

According to the results of our analysis, compared with orthognathic surgery, mandibuloplasty is associated with fewer complications. However, the surgeon must consider all possible complications before the surgery and inform the patients accordingly. Additionally, a surgeon should screen for potential intraoperative problems and postoperative complications before the surgery.

**Minbum Kang, MD**

Romian Plastic Surgery Clinic  
8F, Glass Tower

406, Gangnam-daero  
Gangnam-gu

Seoul 135-080

Republic of Korea

E-mail: minbum.kang@gmail.com

#### REFERENCES

- Baek SM, Kim SS, Bindiger A, et al. The prominent mandibular angle: preoperative management, operative technique, and results in 42 patients. *Plast Reconstr Surg.* 1989;83:272–280.
- Deguchi M, Iio Y, Kobayashi K, et al. Angle-splitting osteotomy for reducing the width of the lower face. *Plast Reconstr Surg.* 1997;99:1831–1839.
- Jin H, Park SH, Kim BH. Sagittal split ramus osteotomy with mandible reduction. *Plast Reconstr Surg.* 2007;119:662–669.
- Park MC, Kang M, Lim H, et al. Mandibular tubercle resection: a means of maximizing the benefits of reduction mandibuloplasty. *Plast Reconstr Surg.* 2011;127:2076–2082.
- Satoh K. Mandibular contouring surgery by angular contouring combined with genioplasty in orientals. *Plast Reconstr Surg.* 1998;101:461–472.
- Yang DB, Song HS, Park CG. Unfavorable results and their resolution in mandibular contouring surgery. *Aesthetic Plast Surg.* 1995;19:93–102.
- Fujimura I, de Souza RR, de Carvalho CAF, et al. A method for locating the marginal mandibular branch of the facial nerve in the neck. *Clin Anat.* 1990;3:143–147.
- Hwang K, Nam YS, Han SH. Vulnerable structures during intraoral sagittal split ramus osteotomy. *J Craniofac Surg.* 2009;20:229–232.
- Kim DI, Nam SH, Nam YS, et al. The marginal mandibular branch of the facial nerve in Koreans. *Clin Anat.* 2009;22:207–214.
- Kim SG, Park SS. Incidence of complications and problems related to orthognathic surgery. *J Oral Maxillofac Surg.* 2007;65:2438–2444.
- Yoon ES, Seo YS, Kang DH, et al. Analysis of incidences and types of complications in mandibular angle osteotomy in Koreans. *Ann Plast Surg.* 2006;57:541–544.
- Iannetti G, Fadda TM, Riccardi E, et al. Our experience in complications of orthognathic surgery: a retrospective study on 3236 patients. *Eur Rev Med Pharmacol Sci.* 2013;17:379–384.
- Panula K, Finne K, Oikarinen K. Incidence of complications and problems related to orthognathic surgery: a review of 655 patients. *J Oral Maxillofac Surg.* 2001;59:1128–1136.
- Kenju S, Yutaka T, Makoto T, et al. Characterization of different paresthesias following orthognathic surgery of the mandible. *J Oral Maxillofac Surg.* 2005;63:298–303.
- Chow LK, Singh B, Chiu WK, et al. Prevalence of postoperative complications after orthognathic surgery: a 15-year review. *J Oral Maxillofac Surg.* 2007;65:984–992.
- Choi BK, Lo LJ, Oh KS, et al. The influence of reduction mandibuloplasty history on the incidence of inferior alveolar nerve injury during sagittal split osteotomy. *Plast Reconstr Surg.* 2013;131:231e–237e.
- Kessler P, Hegewald J, Adler W, et al. Is there a need for autogenous blood donation in orthognathic surgery? *Plast Reconstr Surg.* 2006;117:571–576.