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〔ORIGINAL〕

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Abstract

Sagittal split ramus osteotomy is most frequently performed to correct mandibular prognathism. In this study, intra- and postoperative complications were evaluated in 92 patients treated with this technique. Intraoperative complications occurred in 6 cases (6.5%) of the cases. In addition to experience and skill, complications appeared related to the design of the osteotomy and to attention to detail during the operation. Neurological damage following the sagittal split ramus osteotomy is a common complication after the surgery. Here, sensory disturbance was observed in 63 cases (68.5%) several days after the operation, and in 21 cases (22.8%) at 6 months, 8 cases (8.7%) at one year, 5 cases (5.4%) at 2 years, and 3 cases (3.3%) at 3 years. It was suggested that nerve damage is closely related to the degree of strain and compression of the inferior alveolar nerve.

Key words : Complication, Sensory disturbance, Inferior alveolar nerve, Sagittal split osteotomy, Mandibular prognathism

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Introduction

Intraoral sagittal osteotomy of the mandible was first introduced by Schuchardt[1] in 1942. However, Trauner and Obwegeser[2,3] must be credited for the current popularity of the procedure, which followed their widely read descriptions published in 1957. Later, several modifications of the original procedure have been reported[4-7]. The Dal Pont modification[4], which extends the sagittal osteotomy into the body of the mandible is used extensively, since it assures maximum bone interface and permits adequate healing to occur.

Presently sagittal osteotomy is the most commonly performed orthognathic surgical procedure in Japan as well as in the United States and Europe. Although this technique is fraught with a variety of potential difficulties and complications, the results are excellent and complications are rare when performed by well-trained, experienced oral and maxillofacial surgeons in well-equipped hospitals[8,9]. Several intra- or postoperative complications have been reported in the literature. Neurosensory disturbances of the inferior alveolar nerve commonly follow surgery[9-12]. Others are fractures of the proximal segment[8,9,13,14], incomplete sectioning[11,13,15], malpositioning of segments[14,16], severe hemorrhage[9,11,14,17,18], and infection[19]. From its establishment, our hospital has performed sagittal osteotomy of the mandible on patients with prognathism. This paper reports the complications encountered.

Materials and Methods

Ninety-two patients had bilateral sagittal split osteotomies of the mandibular ramus to correct mandibular prognathism from 1980 to 1995. The age of patients was from 16 to 38 years (mean 22 years) (Table 1). Patients with concurrent genioplasty were excluded from this study.

Surgical technique

Patients are given general anesthesia via nasotracheal incubation. In addition pressor-containing local anesthetic solution is injected into the periramal region. The surgical technique is a standard sagittal osteotomy with minimal soft tissue dissection. The infraoral mucoperiosteal incision is performed at the anterior border of the mandibular ramus. After

Table 1 Age and sex distribution of the patients

Age	Male	Female	Total (%)
16−19	3	28	31 (33.7%)
20−24	9	28	37 (40.2%)
25−29	6	12	18 (19.5%)
30−34	3	0	3 (3.3%)
35−	1	2	3 (3.3%)
	22	72	92 (100%)

Mean of age 22.3±4.8 (16−38years)

the medial surface of the mandibular ramus is exposed with a retractor, the medial cortical bone is cut with a Lindemann bur placed on the medial aspect of the mandible, just above the mandibular foramen and parallel to the occlusal plane of the mandible. For the lateral cut, a bur is placed in a vertical or oblique fashion with the tip just lateral to the angle of the second molar site of the inferior border of the mandible. To join the two sections, the cortical bone of the anterior border of the mandible is scraped off to the cancellous layer with a round bur. The bone is divided with chisels introduced through this third osteotomy line by a slow cutting-wedging technique.

At the completion of the bilateral osteotomy, the distal segment is secured in position by utilizing an occlusal splint and intermaxillary fixation. Care is taken to seat the condyle in the fossa. Then, both segments are stabilized with wiring, screws, or monocortical fixation using miniplates. The wound margins are gently reapporoximated. Catheters for drainage of the wound are never used. Prophylactic antibiotics are given routinely for one week to the majority of cases.

Sensory impairment of the inferior alveolar nerve is examined by the light touch test. In the light touch test, the lower lip and the skin of mental region are lightly touched with a cotton wisp to determine perceptivity. If perceptive, the patients are asked if the perception feels normal or abnormal.

Results

Intraoperative complications (Table 2)

Intraoperative complications occurred in 6 cases (6.5%) of 92 patients: proximal segment fractures in four cases (4.3%); and there were two cases (2.2%) of problematic bleeding on the medial aspect of the ramus and the lateral aspect of the mandible during the operative procedure. The reasons were unclear in one case and due to a facial vein injury in the other.

Table 2 Intraoperative complications.

	case (%)
Fracture	4 (4.3%)
Hemorrhage	2 (2.2%)

Table 3 Postoperative complications.

		cases (%)
Paresthesia	unilaterally	30 (32.6%)
	bilaterally	33 (35.9%)
Air way obstruction		1 (1.1%)
Lingual nerve damage		2 (2.2%)
Facial nerve paralysis		1 (1.1%)
Infection		2 (2.2%)

Postoperative complications (Table 3)

Air way obstruction caused by blood clots occurred in one patient (1.1%) after the removal of the endotracheal tube, and the intermaxillary fixation was quickly removed. However, there was no threat to the patient's life, and bleeding was controlled by sutures of the wound.

Paresthesia of the lower lip and chin occurred bilaterally in 33 cases (35.9%) and unilaterally in 30 (32.6%). Lingual nerve damage occurred in two cases (2.2%) and slight facial nerve paralysis occurred in one patient (1.1%). The paralysis was transient and resolved spontaneously after one month.

Two cases of acute infection appeared during the period of maxillomandibular immobilization on the eighth day after the operation, and after the removal of the fixation (on the fifty-fifth day after the operation). One case was caused by gauze, and the infection gradually subsided after removal of the gauze. The second case was an abscess of the submassetric space of unknown origin. In this case, pus was discharged through an intraoral incision.

Paresthesia of the lower lip and chin, occurred in 63 cases (68.5%). Anesthesia, hypesthesia, or paresthesia of the lip and chin appeared until 48 hours after surgery. The paresthesia was present at 6 months in 21 cases (22.8%), at one year in 8 cases (8.7%), at two years in 5 cases (5.4%) and at three years in 3 cases (3.3%) (Fig. 1). In our series, the incidence of paresthesia after surgery with the Obwegeser method was 59.5% and 79.7% with the Obwegeser-Dal Pont method. Though the former paresthesia returned in all cases, the latter was still present in three cases at three years after surgery (Fig. 2).

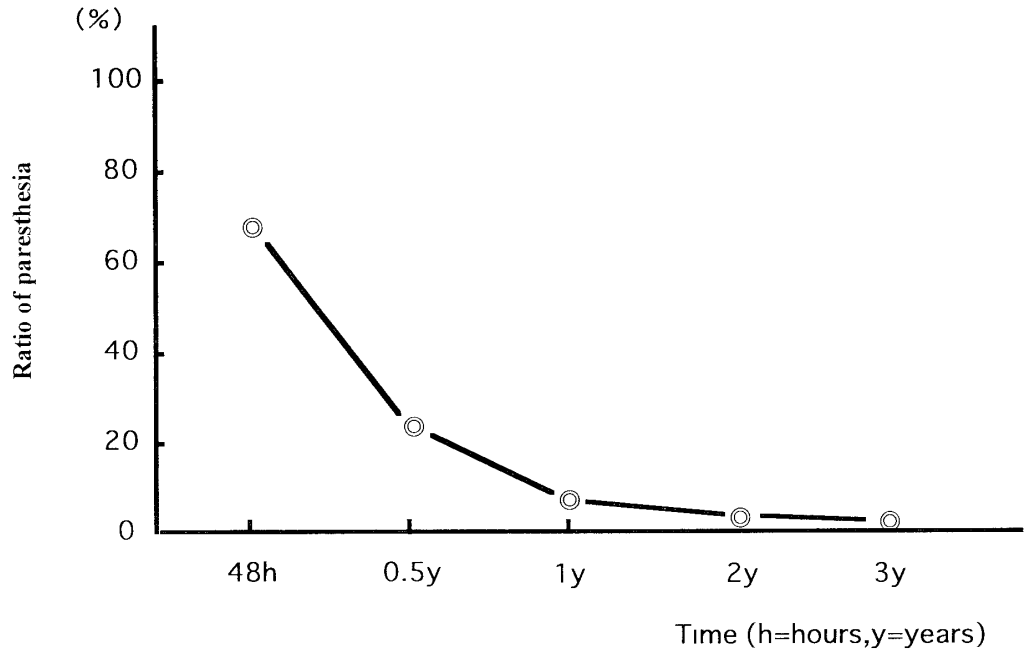

Fig. 1 Duration of paresthesia of the lip and chin after surgery (in 63 of 92 cases)

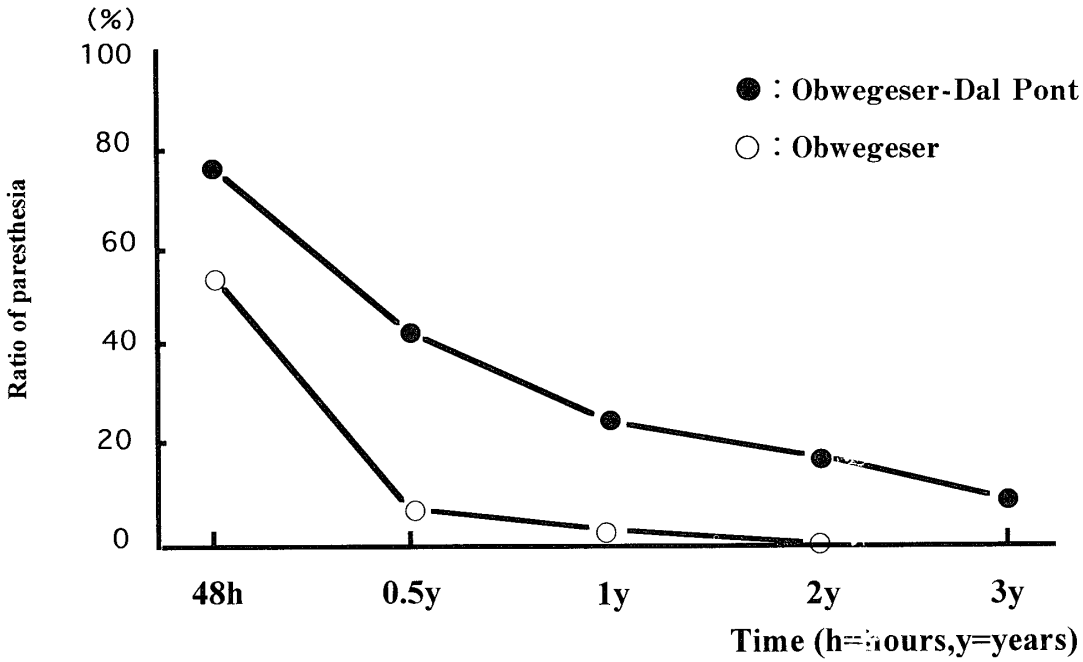

Fig. 2 Duration of paresthesia of the lip and chin after Obwegeser and Obwegeser-Dal Pont procedures (63 cases)

Discussion

Reports on sagittal split osteotomy have described intra- and postoperative complications.

Intraoperative complications

Several papers have discussed intraoperative complications associated with sagittal split osteotomy[9,11]. With the 92 patients here (184 sagittal osteotomies) there was an overall 8.7% incidence of this kind of complications, a figure somewhat lower than reported by others.

Relatively severe bleeding occurred in one case during separation of the lateral cortical plate. The cause of the hemorrhage was unclear and was controlled with packing.

Facial vein hemorrhages occurred when a Lindemann bur inadvertently perforated the periosteum and violated the surrounding soft tissue vessels at the inferior border of the mandible. Gauze in the area of the hemorrhage and extraoral finger pressure on the mandible controlled the bleeding adequately. The incidence of hemorrhages (2.2%) here was much lower than that reported by Behrman[9] (38%) and MacIntosh[11] (10.7%). MacIntosh defined hemorrhages as bleeding that obstructed vision, or bleeding that required time to control. In this series, hemorrhages was defined as bleeding from a relatively large vessel.

Fractures of bony fragments may be caused during splitting of the ramus by chisel or when sectioning of bones is done improperly, because of a very thin ramus, or due to anatomic irregularities[11]. According to Behrman[9] and MacIntosh[11], the incidence of such fractures were 3% and 6.6% respectively. In our series, there were four fractures of the proximal segment (4.3%). Since 1994, CT scans were always made to examine the form of the ramus,

and there has been no such a fracture since then.

Postoperative complications

Postoperative infection occurred in two cases : One was due to remaining gauze. The other was due to unknown cause, but the further course was good.

All of our patients had antibiotics adminstered for at least seven days after surgery, and except the above two cases, there were no postoperative infection. Because of the rarity of infections, even in the absence of prophylactic antibiotics, the role of prophylactic antibiotics is unclear[9,14,20]. However, it is routinely used in orthognathic surgery at our clinic.

Sensory impairment of the lip and chin is induced by direct or indirect damage to the inferior alveolar nerve. Direct damage may be caused by injury to the nerve by protecting retractors, Lindemann burs, chisels during the splitting of bone, and compression by fixation of segments. Indirect damage may be due to edema developing in the madibular canal or around the canal after the operation[14].

In our series, the clinical examination with our method for sensation determination of the inferior alveolar nerve resulted in an incidence of 63 cases (68.5%), and more than 90% of cases had sensory nerve disturbance, return of sensation occurred within 12 months after the surgery. Previous neurologic evaluations of patients who have undergone sagittal ramus split osteotomy have reported incidences of sensory impairment in the mental nerve after surgery from 12.5% to 100%. Long-term follow-up (6 months or more) has shown the incidence of objective sensory alteration ranging from 0% to 85%[11,14,21-27]. The difference in the results may be attributed to the experimental protocol and the method used to evaluate disturbances. In addition, the operative technique employed in different institutions and the definition of disturbance by different investigators may also affect the results[28].

Here, the position of the mandibular canal from ramus to body is comfirmed with CT scan and a very thin chisel is used in bone splitting[22].

Facial nerve paresis is a rare complication and is usually transient[9,11,29]. Full recovery usually occurs spontaneously within two to six months[14]. Here, a postoperative CT scan suggested that the pressure on the nerve trunk by the posterior border of the repositioned distal mandibular segment was responsible for this problem.

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