

## Operative Indications for Enophthalmos Due to Orbital Fractures

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The need for surgery is indicated for an orbital floor fracture, and is often decided by the presence of eye movement disorder or diplopia. Enophthalmos will occur from several months to several years after injury, even when there is no diplopia, and in some cases where eye symptoms such as diplopia appear even later than this. We examined the occurrence of enophthalmos after surgical and conservative treatment of orbital floor fractures. The sequelae after operation were fewer than after conservative therapy. Surgery is clearly indicated when the contents of orbit have prolapsed. It is better not try to forecast the extent of shrinkage of the orbital contents over time, and to operate early after the injury.

### Introduction

The need for surgery for an orbital fracture, and is often decided by the presence of eye movement disorder and diplopia. However enophthalmos may occur several months to years after an orbital fracture in patients with no initial diplopia, and symptoms can develop at later date in such patients. In present study, we examined the occurrence of enophthalmos in patients with surgical and conservative treatment of orbital fracture.

The purpose of this report was to clarify the operative indications of the orbital floor fracture by comparing the surgical and conservative treatments.

### Subjects and Methods

The subjects were sixteen orbital fracture cases who were treated at Tokyo Women's Medical University Daini Hospital from January 1993 to June 1998, and were available for long-term follow-up.

Fifteen cases were men, and one was a woman.

Eight cases were followed-up without operation and eight were surgically treated.

The age range was 14 to 44 years ( $23.4 \pm 10.2$  years: mean  $\pm$  SD) in the conservative group, and 14 to 46 years ( $26.8 \pm 9.3$ ) in the surgical group.

The cases were treated conservatively if diplopia improved within 1 to 2 weeks after injury, or if they did not show prolapse of the inferior rectus muscle into the maxillary sinus on computed tomography. Surgery was performed if the patient did not show improvement of diplopia by 2 weeks after injury, or if the inferior rectus muscle was prolapsed into the maxillary sinus.

The injured side was the right in three cases and the left in five cases for the conservative group, while it was the right in five cases and left in three cases for the surgical group. In the conservative group, seven cases had orbital floor fracture alone and one had medial orbital wall plus orbital floor fractures. All of the cases had isolated orbital floor fractures. All of the operated cases were treated by the inferior palpebral inci-

sion method and gingiva incision method.

## Results

### Sequelae in conservative group (Table 1)

There was no diplopia on lateral gaze in one case with diplopia during the follow-up period, whereas diplopia was noticed at the initial examination. Three cases never had evidence of diplopia. Enophthalmos developed in two cases and diplopia in one of the four cases who had diplopia on upward gaze at the first examination. Sequelae occurred in three cases of eight cases (37.5%).

### Sequelae in surgical group (Table 2)

Four cases with diplopia on upward and outward gaze at the first examination did not have any sequelae. However, one case who had diplopia on upward gaze developed numbness of the cheek and enophthalmos, while the other three had no sequelae. Sequelae were found in one out of eight cases (12.5%).

### Case report

A 26 year-old man was hit in a fight on January 2, 1998. The diplopia appeared 3 days later. At another hospital orbital fracture was diagnosed by computed tomography (CT) on January 5, 1998, and he was referred to our hospital on January 6, 1988. The diplopia had decreased by the time he visited our hospital.

Figure 1 shows CT scan taken in another hospital on January 5. The inferior rectus muscle was not prolapsed into the maxillary sinus, although the adipose tissue in the orbit had prolapsed through the orbital fracture.

He did not have any disorder in eye movement

and his visual acuity was  $V_d = 1.2$ ,  $V_s = 1.2$ . However, he experienced enophthalmos at about one week after injury (Fig. 2), and he began to notice diplopia when drinking. Hess chart was done on May 1. The diagnosis was confirmed by detection of enophthalmos under general anesthesia on May 12.

Operation: The right gingiva and the right lower eyelid were incised, and a fracture in the orbital floor was confirmed. The orbital contents had prolapsed into the maxillary sinus through the fracture. Reduction from inside the maxillary sinus was done, and it was confirmed that there was not entrapment of the orbital contents. One balloon catheters were inserted into the maxillary sinus from the inferior meatus of nose, and the fracture was fixed (Fig. 3). The balloon catheters were removed after 10 days. Ten months after the operation, eye symptoms were completely absent, there was no enophthalmos.

## Discussion

### Blow out fracture and orbital fracture

The bony wall of orbit is weak at the inferior orbital fissure and the medial wall is thin, so fracture often occurs at these sites. The orbital con-

**Table 2** Sequelae in surgical group

Ocular disorders at first examination		Sequelae	
None	3	None	3
Supraversion	4	Diplopia	1
		Enophthalmos	2
		None	1
Eversion	1	None	1

Follow-up period 6 ~ 60 months (average: 34.8 months)

**Table 1** Sequelae of in conservative group

Ocular disorders at first examination		Sequelae	
Supraversion	4	Numbness of cheek and enophthalmos	1
		None	3
Supraversion and eversion	4	None	4

Follow-up period 6 ~ 60 months (average: 32.0 months)

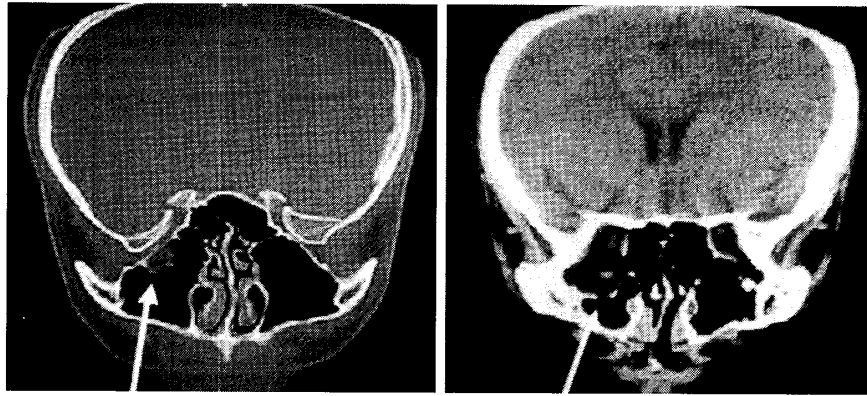


Fig. 1 Computed tomography (January 5, 1998)

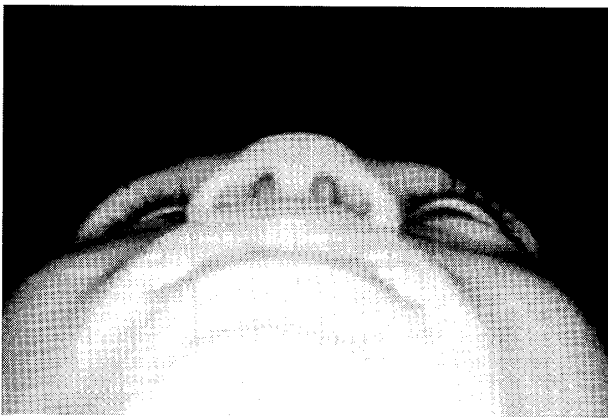


Fig. 2 Facial photograph (A 26 year-old man enophthalmos in right side)

tains, in addition to the eyeball, fat and the extraocular muscles. Painful eye movement and abnormal eye movements occur when the orbital contents prolapse into the maxillary sinus and ethmoidal sinus through a fracturing<sup>1)2)</sup>.

#### Treatment of the orbital fracture

The treatment of orbital fracture includes conservative treatment and operation. Treatment with pendulum exercise is a typical form of conservative treatment<sup>2)</sup>.

Operative procedures include those using a maxillary sinus approach or an inferior palpebral incision<sup>3)4)</sup>, as well as endoscopic operations<sup>5)</sup>. Different methods may also be combined.

#### Operative approach

There are merits and demerits of each opera-

tive approach<sup>3)~5)</sup>, including the maxillary sinus approach, the inferior palpebral incision, and endoscopic operations<sup>5)</sup>, and the optimum treatment policy has not yet been decided upon.

Endoscopic operation<sup>5)</sup> is minimally invasive surgery, but a balloon is used for reduction of inferior orbital fracture. Therefore, reduction of orbital contents cannot be confirmed when fixing the catheter. Orbitotomy and reduction under direct vision are possibly a more certain option, since it is possible to confirm reduction of the orbital contents.

Moreover, bone loss can occur when bone fragments are removed from a splintered fracture of the orbital floor and it is fixed with a balloon catheter. There is a possibility that the entire orbital contents will eventually prolapse into the maxillary sinus when the bone loss is extensive. An inferior palpebral incision or the maxillary sinus approach is more useful rather than the endoscopy, when bone loss is extensive and bone grafting is needed. We operated our case through inferior palpebral incision and maxillary sinus approach because we wanted a precise reduction of the orbital contents.

All of the operated cases were treated by the inferior palpebral incision method and gingiva incision method, because we thought palpebral incision was a safe approach and the wound would

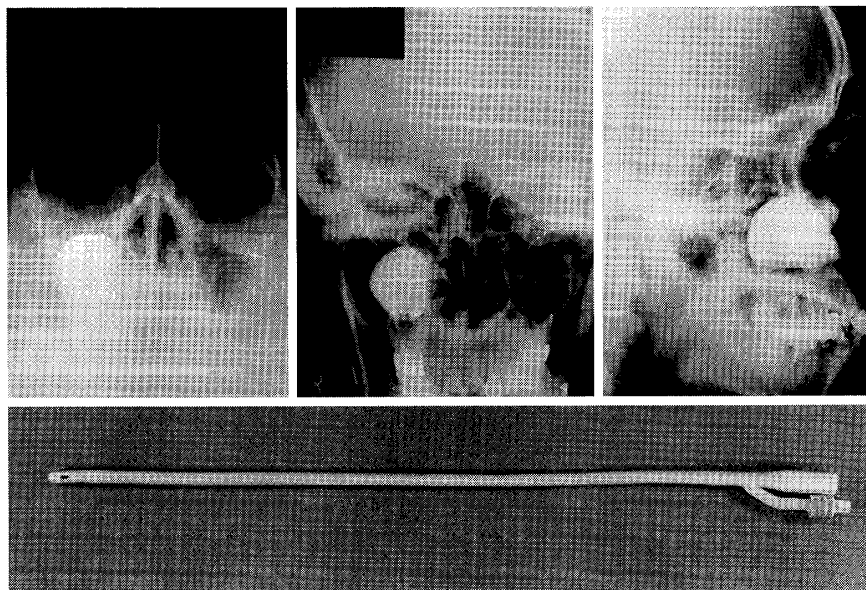


Fig. 3 Balloon catheter and insertion to the maxillary sinus (X-P)

not stand out after operation.

#### Operative indications

Surgery is not only done by ophthalmologists, but also by otolaryngologists and plastic surgeons, and the operative indications vary between each specialists<sup>3)-6)</sup>. There are no universal indications and various indications have been adopted because of differences in diagnosis and treatment between departments. In this study, we compared the sequelae after operation and after conservative therapy.

Though it is often assumed that operation is needed when there is diplopia and eye movement disorder<sup>5)7)</sup> along with enophthalmos (defined as a position of eye retreat), the complaints of the patient should be considered. In our series, eye retreat or diplopia appeared in three of the eight patients (37.5%) treated conservatively versus only one of the eight patients (12.5%) who had surgery.

Fat in the orbit shrinks after several months to years, and then external pressure may cause enophthalmos. It is not easy to forecast the extent of shrinkage of orbital fat on examination. Theoretically, the shrinkage of fat in the orbit

should occur similarly after surgery, but enophthalmos was only seen in one patient (12.5%) after surgical treatment. This may be because there was no macroscopic cause of fat shrinkage in the orbit. After injury, the volume of the orbit may decrease during conservative follow-up because edema and internal orbital bleeding originally maintained the position of eye. Several months after injury, enophthalmos caused, and the case became to need an operation, like our case. When the range of fracture is wide even if there is no diplopia, the operation might be needed immediately after injury.

If diplopia improves within two weeks after injury and there is no prolapse of the inferior rectus muscle on the computed tomography, the possibility of enophthalmos is still high after long-term follow-up.

It is needed for adjustment according to Fujioka et al<sup>6)</sup>, that the difference in protrusion between the right and left eyeball should reach about 3 mm before an operation. The degree in protrusion of the eyeball was not examined in our series. We need to examine more patients to confirm the indications for operation.

### Conclusion

We examined sixteen cases of orbital fracture to clarify the operative indications for the orbital fracture by comparing the surgical and conservative treatments. We found: 1) There were fewer sequelae after surgery than after conservative treatment, 2) It is necessary to operate if the orbital contents have prolapsed, 3) It is difficult to forecast the extent of shrinkage of the orbital contents, and is better to operate early after the injury.

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### 眼窩底骨折による眼球陥凹の手術適応について

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眼窩底骨折 16 例について治療成績を比較検討した。8 例には保存的治療を、他の 8 例には手術療法を行い、保存的治療を行ったうち 1 例に複視、2 例に眼球陥凹の後遺症が残ったが、手術療法を行ったうちの 1 例で頬部のしびれ感および眼球陥凹が後遺症として残った。受傷後に複視が改善しても将来的に複視等の後遺症が出現する可能性がある。眼球陥凹をきたす可能性がある程度の眼窩底骨折は積極的に手術を施行すべきである。