

Management of Posttraumatic Enophthalmos

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Posttraumatic enophthalmos is one of the common sequelae that appears after facial injury and remains a challenge to treat for craniomaxillofacial surgeons. Several theories have been advocated regarding enophthalmos; however, the most well accepted concept is the enlargement of the orbital cavity after displacement due to orbital fractures. Generally, a 1 cm³ increase in orbital volume causes 0.8 mm of enophthalmos. Thorough knowledge of the orbital anatomy is fundamental and critical for the successful surgical correction of enophthalmos because most treatment failures are due to inadequate orbital dissection from fear of injuring the optic nerve and globe. A complete preoperative plan should be built on a comprehensive clinical examination of the periorbital soft tissue and bony components, detailed ophthalmic examination, and high resolution computed tomography scans in the axial, coronal and reformatted sagittal planes. Based on the anatomic deformities, there are two major fracture types including orbital blow out fractures and zygomatico-orbital fractures, resulting in posttraumatic enophthalmos. Treatment modalities and methods of approach are adapted according to the severity of the orbital deformities. Minor complications include ectropion, entropion, dystopia, diplopia, and residual enophthalmos. Rare but severe complications such as intracanal misplacement of the bone graft or retrobulbar hemorrhage with subsequent blindness may be encountered. The success of the procedures depend on adequate dissection and mobilization of the displaced soft tissue, correct repositioning of the dislocated or malunited bony orbit, and proper intra-orbital grafting. (*Chang Gung Med J* 2006;29:251-61)



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During the past decade, the treatment principles of craniomaxillofacial complex bony and soft tissue injuries have dramatically evolved to an early, aggressive one-stage approach. The standard principles in acute facial trauma including (1) precise anatomic diagnosis, (2) direct fracture exposure, (3) rigid internal fixation, (4) primary bone grafting, and (5) soft tissue suspension have been well documented.^(1,2) Lack of recognition of the severity of these injuries, failure to understand the principles of recon-

struction, inappropriate application of the techniques, and inadequate exposure have resulted in post-traumatic secondary facial deformities. These deformities included depressed forehead deformity and temporal hollowing in the upper part of the face, malar malposition, enophthalmos, nasal deformity, and telecanthus in the middle part of the face, and malocclusion related to occlusal problems and temporomandibular joint ankylosis in the lower part of the face. The deformities caused functional limitations

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and were cosmetically unacceptable, moreover, have led to emotional and social problems.

Enophthalmos was found to be the most common type among the cases of post-traumatic facial deformities. It is a sequela of orbital fracture. Although some investigators have suggested that most patients are not bothered by enophthalmos,^(3,4) more recent experience has demonstrated that this is not true. Surgical treatment of post-traumatic enophthalmos remains one of the most challenging procedures because of the dangers and fear of causing injury to the optic nerve, globe and its associated structures. Moreover, secondary procedures to correct this deformity were frequently unsuccessful.

Anatomic considerations

Thorough knowledge of the anatomy of the orbit enables the surgeon to work within the orbit to avoid damage to the ophthalmologic function. This knowledge is critical for the successful surgical management of post-traumatic enophthalmos. The orbit can be conceptualized as a pyramid or a cone with an elliptical base. The orbital areas most frequently needing correction during secondary orbital reconstruction are the orbital floor and medial wall. In a sagittal view of orbit, the contour of the orbital floor is initially concave and then becomes convex upward just behind the axis of the globe at a 30° angle, creating a posterior bulge.⁽⁵⁾ This bulge is essential in maintaining the proper position of the ocular globe. Failure to identify the posterior bulge and inadequate placement of bone grafts or implants to this critical area are common errors to produce enophthalmos in orbital floor reconstruction (Fig. 1). The cross section of the orbital floor travels laterally to medially at a 45° angle inclination to create an inferior-medial bulge which meets the medial wall. Inadequate reconstruction of this convex contour predisposes the patient to enophthalmos. The medial orbital wall is formed by the thin lamina papyracea of ethmoid which bulges inward just posterior to the globe. The medial wall is stronger and less likely fracture than the orbital floor due to support from the honeycomb structure of the ethmoid air cells. Two important structures must be kept in mind. The first is the anterior ethmoid vessels coming out from the anterior ethmoid foramen which is an average of 24 mm behind the anterior lacrimal crest. The second important landmark, the posterior ethmoid foramen, indi-



Fig. 1 Computed tomography shows improper placement of implant at left orbital floor (arrow) due to inadequate exploration to the posterior ledge.

icates the limit of safe dissection along the medial wall. This landmark is an average of 36 mm away from the anterior lacrimal crest and marks the level of the posterior ledge of intact orbital bone in the medial wall. The distance between the posterior ethmoid foramen and the optic foramen vary from 3 to 12 mm with an average of 7 mm.⁽⁶⁾ A horizontal line connecting the anterior and posterior ethmoid foramen indicates the superior limit of the ethmoid sinus. The medial wall fractures rarely extend above this horizontal line. Therefore, dissection of orbital medial wall is better from the intact superior medial wall to identify the boundary of medial wall defect especially during secondary orbital reconstruction. In order to thoroughly understand the internal orbital anatomy and perform a safe orbital dissection, Danko and Haug⁽⁷⁾ examined cadaver head specimens to investigate the distance from the orbital rim to the important soft tissue of the orbital apex. The mean distance was 44.1 +/- 1.4 mm medially, 38.3 +/- 3.0 mm laterally, 44.5 +/- 1.72 mm superiorly, and 39.4 +/- 2.9 mm inferiorly. No distance was less than 31.0 mm or exceeded 51.1 mm. A similar study had been done by Rontal et al.⁽⁶⁾ and they recommended that the safe distances for dissection were: (1) medially, 30 mm from the anterior lacrimal crest; (2) inferiorly, 25 mm from the infraorbital foramen; (3) superiorly, 30 mm from the supraorbital notch; and (4) laterally,

25 mm from the frontozygomatic suture.

Pathophysiology

The exact mechanism of post-traumatic enophthalmos remains incomplete and unclear. Numerous theories have been proposed to account for enophthalmos including: (1) enlargement of the orbital volume by displaced fractures, (2) fat atrophy or necrosis, (3) scarring of retrobulbar tissues tethering the globe in a posterior position, (4) loss of ligamentous support, and (5) entrapment of the connective-tissue septal system in a blowout fracture.⁽⁸⁻¹⁰⁾ These theories are based on the anatomic concepts of the deformities and each emphasized a different viewpoint of the orbital anatomy as the cause of enophthalmos. Manson and colleagues⁽¹¹⁾ studied the orbits of both cadavers and patients. During the study, they were able to demonstrate that the principal mechanism of posttraumatic enophthalmos involved a displacement and change in the shape of orbital soft tissue caused by the loss of bone and ligament support. Fat atrophy was not a prominent feature of posttraumatic enophthalmos. Gruss⁽²⁾ also stressed that posttraumatic enophthalmos was almost entirely due to the displacement of the orbital wall with enlargement of the bony orbital cavity. Furthermore, enlarged posterior orbital volumes were common findings on computed tomography (CT) scans of patients with enophthalmos, suggesting that larger retrobulbar spaces allow the globes to drop posteriorly in the orbits. However, the cause of residual enophthalmos following orbital reconstruction may not be the same mechanism as in orbits that did not undergo surgery. The soft tissue atrophy may play some role in the reconstructed orbits.⁽¹²⁾

Since enlargement of the orbital bony volume is the major cause of enophthalmos, a number of authors studied the relationship between the degree of enophthalmos and the orbital blow out fractures using CT scans to identify the patients at risk of late enophthalmos. Whitehouse et al.⁽¹³⁾ found a 1 cm³ increase in orbital volume causing 0.8 mm of enophthalmos, providing that measurements were performed more than 20 days after the injuries. A recent study by Ploder and coworkers⁽¹⁴⁾ demonstrated that in patients with isolated orbital floor blowout fracture, enophthalmos of 2 mm can be expected with 3.38 cm² of the fracture area and 1.62 ml of the displaced tissue, and the relationship was valid 10 days

after the injuries. In a study on late post-traumatic enophthalmos, Schuknecht and associates⁽¹⁵⁾ concluded that enophthalmos of 3.5- 5 mm corresponded to a mean increase in orbital volume of 7.1 ml, while enophthalmos of 2.5-3 mm correlated with an increase in orbital volume of 3.4 ml. In order to precisely correct the late enophthalmos caused by a medial orbital wall defect, Lee⁽¹⁶⁾ used diced cartilage grafts to fill up the defect and found that 1.37-1.5 ml of the graft material resulted in a 1 mm forward advancement of the globe position. Although many researchers have conducted studies regarding orbital volume measurement, the reports have shown neither concurring data nor consistent conclusions. The reasons behind the disparity are factors such as differences in measuring tools, software, and radiographic tracing points. Timing of intervention and measurements may also affect the results. The small volume of the orbit, only 30-35 cm³ may likewise be a cause of difficulties in these studies.⁽¹²⁾ In spite of this amount of data, the 3-dimensional information of the orbital volume obtained from the CT scans may not be clinically useful for the surgeons to precisely correct the orbital volume deficiency as most implants or autogenous graft materials are flat and two-dimensional.

Preoperative evaluation

In forming a thoughtful preoperative plan, comprehensive clinical examination and complete radiographic evaluation of the orbit must be carried out. Careful review of the patient's medical history including the injury mechanism and previous operations on the facial skeleton not only allows for better understanding the extent of periorbital fractures but also alerts the surgeon to other possible causes of post-traumatic enophthalmos. Preoperative photographs including the premorbid photographs are beneficial not only as baseline records but also as valuable assets in treatment planning.⁽¹⁷⁾ Documentation of the patient's subjective complaints and wishes are important because it may affect the surgeon's decisions. For example, in a certain case the enophthalmos was caused by inadequate reduction of the zygomatic fracture and reconstruction. However, in some situations, the patients may just wish for enophthalmos correction without mobilization of the deformed zygoma. The surgeon is then required to judge and balance between patient's

wishes and surgical procedure and outcome.

The periorbital examination including the soft tissue and bony components must be analyzed. The displaced position of the brow, the medial and lateral canthi as well as the changes of the lengths of the palpebral fissures reflect the changes in the underlying position of the orbital rim structures that need to be corrected. The presence of infraorbital nerve numbness as well as evidence of lacrimal duct obstruction should be noted. The projection the malar body and the contour of the arch should be compared with the uninjured site. The presence of a deepening supratarsal sulcus and hypoglobus indicates loss of support inferiorly and posteriorly. The relative anterior-posterior position of the globe is assessed most accurately through an inferior view. Hertel exophthalmometry is accurate in defining the differences between the globe position of the injured and uninjured side provided that the lateral orbital rim is in the correct and symmetrical position. If the lateral orbital rim is malpositioned, examining the patient from the lateral view using the superior orbital rim as reference points is recommended.

Preoperative ophthalmology consultation is routinely sought. Ocular examination should include assessment of the visual acuity, visual field, pupillary function, extraocular muscle function, and slit lamp examination to rule out corneal perforation or hyphema. A dilated fundus examination is carried out to identify any optic nerve and retinal pathologies. A forced duction test advocated by Putterman⁽¹⁸⁾ must be considered when restriction in ocular movement is detected. The presence of diplopia is frequently associated with limitations of extraocular muscle movements. One must differentiate the causes of diplopia which may result from (1) orbital tissue entrapment, (2) injured cranial nerve induced malfunction of eye muscle, and (3) malposition of globe.

Image studies may include plain radiographs and CT scans. Recently, the development of the helical CT scan has changed the types of studies needed to diagnose and evaluate orbital trauma. The helical CT scan allows for continuous acquisition of volumes of tissue, which permits multi-planar reconstructions of additional image planes. This technique promises to reduce the number of examinations and radiation exposure of the patient while improving the quality of the images.⁽¹⁹⁾ In addition, the radiation

dose delivered to the lens is much less than that of conventional CT scans. Total scanning time is reduced (18 seconds for a helical scan compared with 104 seconds for conventional CT axial and coronal scans).⁽²⁰⁾ CT scanning has much improved our preoperative assessment capability of post-traumatic enophthalmos and has become a standard examination tool in our practice. The fine-cut CT scans are taken both in axial and coronal planes, with soft tissue and bone windows. The reformed sagittal sections that connect the apex of the orbit and the midpoint of the globe are particularly helpful to assess the situation and adequacy of previous reconstruction of the orbital floor fractures. The CT scans should be used to show the adjacent cavity and structures and detect associated periorbital deformities to aid the surgeon in making a proper therapeutic plan. Three-dimensional CT images serve as a quick overview of the pathologic condition but they are seldom of value in the internal portion of the orbit.⁽⁹⁾

Treatment

Tessier, a pioneer in the field of craniofacial surgeon, documented the principles of correction of post-traumatic enophthalmos including: (1) complete subperiosteal dissection to free the periorbital tissue from displaced orbital fragments, (2) repositioning of the orbital framework with osteotomies, and (3) reconstruction of the walls and framework with bone grafts.⁽²¹⁾ In order to obtain adequate exposure and soft tissue mobilization, the 360-degree circumferential subperiosteal dissection of the orbit down to the orbital cone through coronal and lower lid incisions has been advocated.^(2,22,23) However, this concept has been found to be unnecessary to correct globe position, even in cases of long-standing enophthalmos. In fact, this may aggravate problems of the globe position and vision function. The intraorbital dissection need only be confined to the area of previous damage.^(12,24)

As discussed earlier, displacement of the orbital wall with increased bony orbital cavity was the main reason of post-traumatic enophthalmos. The aim of enophthalmos correction is restoration of the bony volume of the orbit. The concepts of the 3-step approach to correct post-traumatic orbital deformities advocated by Grant et al.⁽¹²⁾ consist of mobilization of the soft tissues in the area of fracture, repositioning of the anterior and middle sections of the bony

orbital rim followed by reconstruction of the inner orbital wall, and reattachment of the soft tissue to the bone at the proper location. They emphasized that restoration of the position and shape of the orbital soft tissue by mobilization and reconstruction of the bony orbit significantly improved enophthalmos.⁽¹¹⁾ Contemporary treatment of post-traumatic enophthalmos and surgical approaches are based on the severity of the orbital deformities and fracture types. In general, two fracture types including orbital blow out fracture and zygomatico-orbital fracture are the main etiologies causing late enophthalmos.⁽²⁵⁾

Deformity with orbital blow out fracture

Usually an enlarged orbital wall is caused by an unrepaired orbital medial wall fracture, inadequate floor reconstruction or combination of both factors. Inadequate primary internal orbital reconstruction frequently results from fear of injury to the optic nerve and then failure to identify the posterior ledge of the orbital floor. On the other hand, the medial orbital blowout fractures also play an important role of late enophthalmos, because there is a high incidence of occurrence, a low rate of diagnosis, and a high severity of defect. Pearl and Vistnes⁽²⁶⁾ found that 50% of patients with blow out fractures had associated medial wall fractures. Late enophthalmos was found in 76 % of patients with medial wall fractures in the study by Burm et al. of 76 patients with pure orbital blowout fracture.⁽²⁷⁾

Many methods have been used to explore the orbital medial wall including the remote coronal incision, direct local medial canthal incision⁽²⁸⁾ and W-shaped incision.⁽²⁹⁾ The incision may extend to the infraorbital rim to explore the orbital floor.⁽³⁰⁾ Alternatively, a medial transconjunctival incision using rigid endoscopic assistance provides adequate exposure to the medial orbital wall with excellent cosmetic and functional results.^(31,32) This technique is applicable to all sizes of defects, and is especially useful for those involving the superior and posterior medial orbit, which is difficult to dissect through a lower lid incision. In general, the endoscopic technique can be applied for primary and secondary repairs of medial orbital wall defects and the correction of enophthalmos.⁽⁵⁾

The deformities limited to the orbital floor are best accessed through either a lower eyelid subciliary incision or an inferior transconjunctival incision. If

the transconjunctival incision is used, a lateral canthotomy and cantholysis may be added to provide wider exposure and placement of larger graft for reconstruction of the orbital floor. Although the transconjunctival approach leaves no facial scars and has lower incidence of ectropion than standard subciliary incision, one should be cautious when using this approach on patients who have had previous transcuteaneous incisions because of a high incidence of post-operative ectropion.⁽³³⁾ In addition, the presence of orbicularis muscle weakness or lower lid shortening must be taken into consideration in designing a lower eyelid incision. Additional exposure of the orbital floor may be obtained by inferior orbitotomy.⁽³⁴⁾ Using a marginal osteotomy along the inferior orbital rim, the prolapsed orbital tissue becomes easier to be released from the maxillary sinus without injury to the infraorbital nerve and can be moved back to the orbital cavity.

After the reduction of all herniated periorbital contents, the orbital defects are clearly identified and the surrounding bony shelves are delineated to facilitate placement and decision of the shape and dimensions of the grafts. The choice of metal, alloplastic material, or autogenous bone graft depends on operator preference, and the need to achieve a stable construct. These grafts are placed on the delineated bony shelves from the posterior orbit to the anterior orbit. Whenever possible, the grafts must be rigidly fixed with microscrews or microplates to the orbital rim in cases with extensive orbital wall defects. Fixation improves the predictability of reconstruction and prevents migration of the material.⁽³⁵⁾ Figures 2 shows a clinical case.

Orbito-zygomatic deformity

Pearl⁽³⁶⁾ stated that the most common causes of enophthalmos were not blow-out fractures but inadequate reduction of zygomatic fractures. Inadequate reduction of displaced orbitozygomatic fractures produce flattened malar areas, increasing facial width and external rotation of the lateral orbital walls, which result in markedly increased orbital volumes and subsequent enophthalmos. Therefore, treatment of enophthalmos relies on the degree of displacement of the lateral orbital wall and rim as well as the patient's preference or choice. If a patient is not willing to undergo a zygoma repositioning procedure through an orbitozygomatic osteotomy or presents

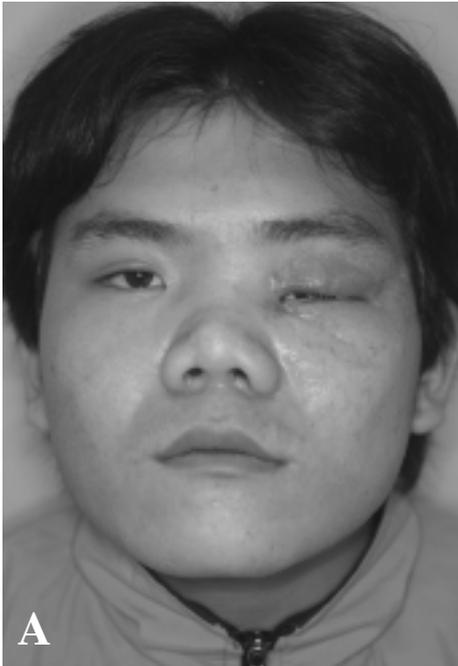


Fig. 2A, 2B A 26-year-old patient with left enophthalmos mainly caused by previous inadequate orbital floor reconstruction. Preoperative frontal and submental views showing left hypoglobus and ptosis.

with a deformity involving only minor rotation of the zygomatic body, the surgical procedure is similar to the method for repairing a deformity caused by an orbital blow out fracture. The correction of enophthalmos should focus on the reconstruction of the internal orbital wall, especially adding grafts on the lateral orbital wall. As outlined previously, the basic principles of a successful correction rely on adequate exposure, complete release of periorbital tissue in the injured area and sufficient onlay grafting.

In most situations, the “malunited” and displaced zygoma needs to be repositioned into its correct anatomic position. Accurate re-establishment of

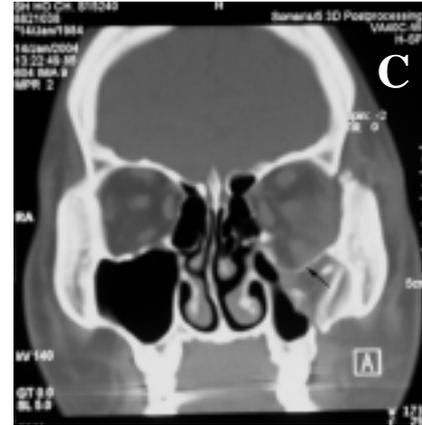


Fig. 2C Preoperative computed tomography reveals improper downward displacement of mesh implant (arrow) at left orbital floor and unrepaired orbital medial wall fracture with enlarged orbital cavity.



Fig. 2D, 2E Postoperative frontal and submental view 6 months following orbital wall reconstruction.

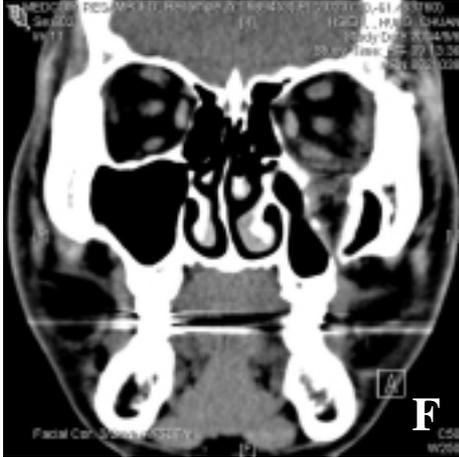


Fig. 2F Coronal view of postoperative CT scan after reconstruction of the orbital floor, medial and lateral wall with Medpor implants which is not visible on CT scan. Please note symmetric position of medial rectus muscle and inferior rectus muscle on both orbital cavities.

the correct position of the zygoma body and the orbital rim helps restore the correct orbital volume and, combined with deep orbital bone grafting, corrects enophthalmos.⁽²⁾ The orbitozygomatic deformity is corrected by recreating the fracture pattern and repositioning the bone. Following the old fracture lines as a guide for osteotomy has been advocated to correct the posttraumatic orbitozygomatic malposition.⁽³⁷⁻³⁹⁾ The corrective osteotomies are performed at the fronto-zygomatic suture, infraorbital rim, zygomatic arch and lateral maxillary buttress. To accomplish this, the traditional coronal, cutaneous lower eyelid and intraoral incisions are used to obtain wide exposure of the orbito-zygomatic complex and facilitate deep orbital exploration.^(2,22,25)

Based on considerable their experience, Longaker and Kawamoto⁽²⁴⁾ used limited exposure via the lateral upper blepharoplasty, transconjunctival without canthotomy and intraoral incisions to recreate the fracture, mobilize and reposition the malunited zygoma instead of the conventional coronal approach. The advantages of this approach are reduced morbidity and hospital stay, shorter operating time, and avoidance of blood transfusions. The authors agree with the concepts advocated by Longaker and Kawamoto⁽⁹⁾ using a limited access technique instead of extensive exposure for mobilization of malunited zygoma to correct posttraumatic enophthalmos. The limited exposure is performed

only via an extended infraorbital incision with lateral canthotomy and upper buccal incision. The extended infraorbital incision with lateral extension is used to expose the fronto-zygomatic junction, lateral orbital wall, infraorbital rim, and zygomatic arch. This approach obviates the eyebrow incision, which is visible in some patients.⁽³⁶⁾ All the osteotomies can be done under direct vision except for the zygomatic arch at which the bony cut is made using an angled oscillating saw with the assistance of a 4 mm, 30° endoscope. Therefore, the deformed zygoma is completely mobilized and repositioned to restore anatomic alignment. Following the anatomic reduction of the fracture, the remaining orbital defect is repaired with grafts when necessary. The most difficult part in this procedure is determination of the precise position of the mobilized zygoma in a three-dimensional space. Hammer and Prein⁽⁴⁰⁾ stressed the value of the lateral orbital wall as a reliable landmark during secondary revisions. However, this maneuver is useful only when the lateral orbital wall has not been disrupted severely by the injury.⁽²⁵⁾ Recently, advancement in computer and navigational technologies helps ensure the position of the repositioned bony complex precisely and improve accuracy of the orbital reconstruction.^(41,42) Figures 3 demonstrates a clinical case.

Complication

The complication rate of 10 to 15% after orbital reconstruction has been reported.⁽⁴³⁾ The common postsurgical sequelae are ectropion with sclera showing or entropion, both of which are related to surgical incisions and may be minimized with meticulous



Fig. 3A Preoperative view of patient with right enophthalmos and malar depression.

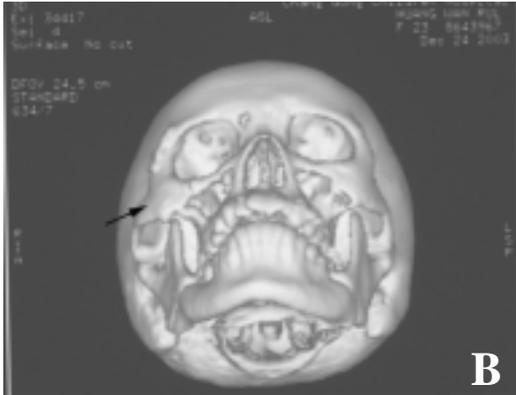


Fig. 3B Preoperative three-dimensional CT scan shows right malunited zygomatic deformity with downward displacement (arrow), causing enlarged lateral orbital wall.



Fig. 3C Preoperative coronal section of CT scan demonstrates right enlarged orbital cavity caused by malunited zygomatic fracture and orbital floor depressed fracture (arrow) without reconstruction.



Fig. 3D Postoperative appearance 1 year after correction of the orbito-zygomatic deformity and orbital floor reconstruction.



Fig. 3E The 3-D CT scan reveals successful repositioning of the right zygoma with symmetry malar projection.

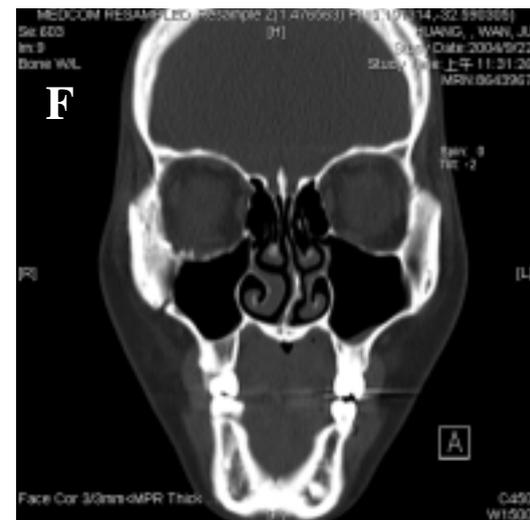


Fig. 3F Postoperative coronal section of CT scan reveals symmetry orbital cavity with correction of the floor defect.

surgical dissection and soft tissue resuspension. Transient exophthalmos and diplopia are expected and usually resolve within 2-3 months. However, worsening of double vision and dystopia had been observed postoperatively after correction of late enophthalmos.⁽⁴⁴⁾ Residual enophthalmos has been seen commonly due to the difficulty in accurately assessing orbital volume intra-operatively and limitations from the increased intraocular pressure. The endpoint of orbital reconstruction is reached when the globe feels tight on palpation and can not be

moved forward by additional grafts in the orbit. In this situation, one should stop orbital reconstruction and a second operation is necessary for the correction of residual enophthalmos. Any secondary procedure should be deferred for 6 months following the primary orbital surgery until resolution of edema and scar maturation.^(9,25)

Occasionally, exaggerated overcorrection grafting have been attempted and resulted in intraconal misplacement of bone grafts or implants (Fig. 4) which further interfered in extraocular muscle motion or impairment of blood supply to the optic nerve causing diplopia and dystopia or visual impairment, respectively.⁽⁴⁵⁾ The most severe but rare complication associated with periorbital surgery was retrobulbar hematoma which resulted in direct compression of optic nerve and/ or retinal ischemia due to elevated intraocular pressure.⁽⁴⁶⁾ Visual deterioration or blindness may occur subsequently if early diagnosis and immediate treatment are not carried out. To avoid this potential disaster, a small drain tube placed in the lower eyelid incision for blood drainage during secondary orbital reconstructive surgery is recommended.

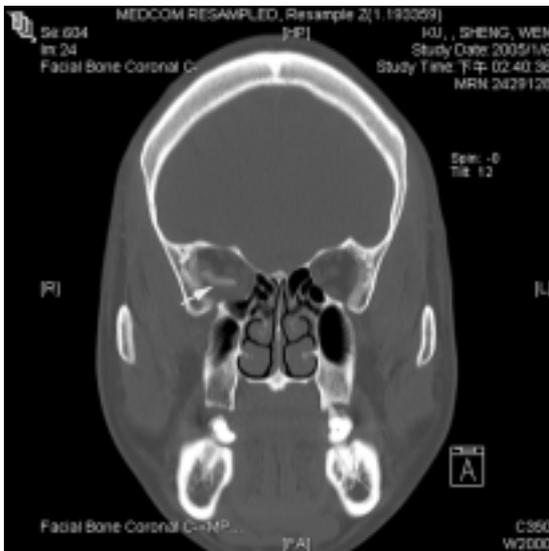


Fig. 4 Coronal view of computed tomography demonstrating a titanium mesh (arrow) placed within the intramuscular cone.

Conclusion

The diagnosis and treatment of posttraumatic enophthalmos has benefited from advances in several

areas, including the development of alloplastic materials and advancement of radiologic imaging and surgical techniques. Recognition of the deformity in periorbital area is critical, and a thorough physical examination especially including ocular examination and fine-cut CT scans provide the guidance as to what procedure should be performed. The concept of a 360-degree circumferential orbital dissection has been changed to a limited intraorbital dissection confined to the area of previous damage to avoid unwanted globe injuries. The successful orbital reconstruction relies on complete mobilization of the soft tissues in the area of the fractures, repositioning of malunited periorbital segments and adequate restoration of the bony volume of the orbit. Meticulous surgical dissection, proper position of intraorbital grafts and adequate hemostasis are mandatory to avoid intraoperative and postoperative complications.

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外傷後眼球凹陷的治療

陳建宗 黃慧芬 陳昱瑞

外傷後眼球凹陷是顏面外傷常見的後遺症。對於顱顏外科醫師而言仍具有挑戰性。有許多原因可造成外傷後眼球凹陷症，但移位性眼眶骨折所造成眼窩體積變大，仍是大家所共同接受最主要的原因。一般而言，每增加 1 立方公分的眼窩體積可造成零點捌毫米的眼球凹陷。要想成功地矯正眼球凹陷的問題，徹底地了解並熟悉眼窩解剖位置及結構是基本而重要的。大多數手術失敗的原因是因為害怕傷害視神經而不敢做徹底足夠的眼窩剝離。術前周詳的計劃建立於完整的眼眶周圍軟組織及骨骼的理學檢查。詳細的眼科學檢查及包含各種切面的眼眶電腦斷層檢查，依據解剖上眼眶周圍及眼窩變形的嚴重程度，將眼球凹陷的主因分成兩種類型包括 (1) 眼窩暴裂性骨折引起眼窩壁骨的缺損，(2) 眼眶及顴骨的骨折導致眼窩變形及體積容量增大。治療的方式則依據眼窩凹陷變形的嚴重程度及類型而採取不同的術式。術後一般併發症包括眼瞼的外翻或內翻、複視、眼球的移位，及眼球凹陷校正不足。但有時也會出現嚴重的併發症，例如眼窩內骨移植片的錯置或是眼球後的血腫形成而造成眼睛失明。因此成功的手術必須要能做到足夠的剝離出已脫出的眼窩軟組織並放置回眼窩內，將癒合不良的眼眶骨骼經由骨切開術而移動至正確的解剖位置上並精確的眼窩壁重建。唯有小心翼翼的手術剝離及正確的骨移植片放置才能減少術後的併發症。(長庚醫誌 2006;29:251-61)

關鍵字：眼球凹陷症，眼眶骨折，內視鏡，顏面外傷。

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