# Cephalic traumas with lacrimal apparatus involvement. Our experience



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#### Cephalic traumas with lacrimal apparatus involvement. Our experience

PURPOSE: The involvement of the lacrimal ducts in the extreme cephalic trauma is an infrequent condition. A correct diagnosis and appropriate management of injuries of the lacrimal system are essential to prevent the onset of post-traumatic.

METHODS: In the last 5 years, 37 patients were treated for lacrimal apparatus injury as a result of cephalic trauma: in 16 there was an isolated lacrimal injury and in 21 were documented fractures combined with lacrimal damage.

RESULTS: In 16 patients who had only deep lesions, was performed a reconstruction after location lesion localization, and only in 4 cases, because of the gravity of the lesion, it was decided to perform a reconstruction in a second time. In the remaining 21 patients the facial fractures were treated before lacrimal injuries, whose reconstruction was carried out on a second time.

CONCLUSIONS: The reconstruction of the cephalic district has to be based on the restoration of morpho-functional component and on the identification and treatment of lacrimal injuries. The reduction of fractures in our view should start from the lateral area (centripetal reconstruction) allowing to have a guide for alignment of the fracture lines. The objectives to be achieved in a facial trauma are therefore three: the maintenance of vital functions, the recovery of the function and the restoration of morphological and functional prior to the event.

KEY WORDS: Facial trauma, Lacrimal apparatus laceration, Lacrimal ducts reconstruction.

# Introduction

Because of the central location in the middle third of the face, lacrimal apparatus can therefore be affected by trauma involving different anatomical and aesthetic units such as nasal, orbital, zygomatic arch and malar apophysis with its temporal, frontal and maxillary (Fig. 1).

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Fig. 1: Lacrimal system pattern.

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Injuries involving the lacrimal apparatus are characterized by deep wounds that are often associated with facial bone fractures, and therefore, the patients must be evaluated to exclude any associated more serious injuries that could be a risk for their life.

This chapter will highlight what are the most common injury that can involve tear system, trying to provide a guideline for the diagnosis, treatment and prognosis.

# Materials and methods

At the Department of Plastic and Reconstructive Surgery, University of Perugia, inter-Complex Structure of Perugia and Terni, from January 1<sup>st</sup> 2006 to September 30th 2011 were treated 37 patients came to our attention for cephalic injuries with lacrimal system involvement. Of these, 25 were males and 12 females with a mean age of 38 years. The distribution of trauma is reported in Table I.

A careful medical history, if conscious and cooperative patient, will help you understand modalities and intensity of the trauma and will help the examiner during the general examination of the patient thought-out an assessment of symptoms and pathological signs resulting from trauma.

The inspection is often burdened by massive edema that make diagnosis more difficult <sup>1</sup>. A subconjunctival hemorrhage, especially if associated with eyelid hematoma, suggests orbital fractures in the nasal region. Epistaxis is constant in fractures of the nasal pyramid and is accompanied by liquorrea when ethmoidal lesions are present <sup>1,2</sup>. In parallel with these basic procedures are very important instrumental examinations (roentgrafie encoded in the two projections and also threedimensional computed tomography CT) that allow a precise diagnosis in more than 95% of cases <sup>3</sup>. In the presence of wounds of the evelids, it must always assess the integrity of the apparatus by careful atraumatic exploration of the tear system that will allow to classify the lesion as frank or as a bruise, its location (external, internal or medial) and thus the involvement of the upper canaliculus, lower canaliculus, common canaliculus, the lacrimal sac or nasolacrimal canal. When the canaliculus is sectioned laterally will be easier identify the lesion through a simple cannulation.

 
 TABLE I - Distribution of cephalic traumas with lacrimal system involvment

Deep lesions without fractures	16 pz (43.3 %)
Deep lesions with	associated fractures:
Le Fort II fractures	11 pz (29.7 %)
Le Fort III fractures	4 pz (10.8 %)
CNEMFO fractures	6 pz (16.2 %)

Instead, when the lesion affect the medial part, the maneuvers will be more difficult and the use of eye drops with rifampicin or fluorescein solutions injected into the canaliculus or into the sac will guide the identification of the canalicular structures <sup>4-6</sup>.

## Results

In the 16 patients who had only deep facial lesions damaging the lacrimal apparatus without associated fractures, once secured the vital functions and arrest any bleeding, a surgical toilette was carried out together with antibiotic and anti-inflammatory therapy. After localizing the laceration, the repair will be done through cannulation of the lacrimal structures with a thin polyethylene catheter Silastic, probe type bicanalicolare of Roye, and a microsurgical repair preferably carried out with a microscope (Fig. 2). The sutures were performed without creating tension with a monofilament 8-0 to 10-0 helped by a bicanalicular probe to maintain in line both the stumps and to calibrate the sutures <sup>5,6</sup>. In 4 patients was preferred to delay the reconstruction of these structures due to the presence of large lesions causing an impediment in localizing and then in reconstruction of lacrimal pathways: in these cases we proceeded with the reconstruction of non-skeletal structures and soft tissue lesions and, in a second time, with the restoration of a tear outflow by the use of a "bypass" Lester-Jones tube or reconstructing a new naso-lacrimal duct by a conjunctival mucosa flap or muco-periosteal flap, mobilized from the lateral nasal wall 7-10. The remaining 21 patients with associated fractures were managed by treatment of the bones damages in the acute phase and, in a second time, by the reconstruction of anatomical and functional alterations of the tear duct using the above mentioned techniques. In cases of multiple comminuted malar-zygomatic fractures associated with cranio-facial lesions the surgical

access adopted, in our opinion to be preferred to others due to the wide exposure of the fracture lines, has been the bicoronal one. In order not to damage the frontal branch of the facial nerve, the dissection was performed between the deep temporal fascia and temporal muscle. In all patients was carried out a cleaning and a removal of foreign bodies from wounds, and then exposure and reduction of fracture sites using rigid fixation through the use of "microplates" for the fronto-zygomatic suture, the margin lateral orbit and zygomatic arch and "miniplacche" for the malar bone <sup>11,12</sup>. In the end, have been rebuilted and repositioned in the non-skeletal structures damaged in order to achieve a complete and correct restoration of the vertical, horizontal and transverse size for a "three dimensional" reconstruction around the middle third of the face 13,14.



Fig. 2. Incannulation and reconstruction of the inferior canaliculus.

#### Discussion

Injuries involving the lacrimal apparatus are characterized by deep wounds often associated with bone fractures and facial trauma and the patient must be evaluated from a general point of view to exclude any associated more serious injuries that could be a risk for his life. A 'careful' reduction of all fractures and restoration of the strength pillars and the vertical, sagittal and transversal dimension are the basis for the success of the treatment of this traumatic pathology. The structure is most frequently affected is the inferior lacrimal canaliculus and the injury of two or more common ducts is rare. Lesions of the sac and the nasolacrimal duct are more frequent in cases of trauma that cause craniofacial disjunctions as Le Fort type II, III. The maxillary bone fractures are those that mostly involve lacrimal system. It's nowadays recognized the need to reconstruct the middle third facial skeleton starting from the fronto-orbito-zygomatic ("sequential" three-dimensional reconstruction), only after have restored the dental occlusion by "B.I.M." and reconstructed the palatal and mandibular fractures when present.

When conditions permit, it is preferable to refer patients for immediate surgery in about 12-24 h after trauma and the reconstruction should be rarely procrastinate: respecting these times will have a better chance for "restitutio ad integrum".

#### Conclusion

Since the traumas of the middle third of the face are a very frequent condition and their (cranial and / or visceral) are ones of the leading causes of death in patients under 40 years, the goal of initial treatment of these lesions is to prevent the so-called "short-term morbidity", so frequent in these patients. The involvement of the lacrimal ducts in the cephalic trauma is an uncom-

mon condition but should always be kept in mind whenever there are lesions involving the middle third of the face.

The reconstruction of the cephalic district imply the restoration of the important morpho-functional component and therefore it will be important to evaluate the involvement of the lacrimal structures. The reduction of fractures in our opinion should start from the lateral area ("centripetal" reconstruction Fig. 3) allowing to get as a guide for a proper projection of the zygomus the allignment of the zygomatic arch and lateral orbital region fracture lines. It's also important to restore proper occlusion so as to have, as a third reference point, a correct interdigitation and fixation of the zygomatic bone with the maxilla to be sure that the cheekbone is in its natural place, and that has been restored the continuity of the zygomatic-maxillary bone pillar.

The aims to achieve in a facial trauma are therefore three: the maintenance of vital functions, the recovery of the function and the restoration of morpho-functional balance prior to the event.

#### Riassunto

Nonostante l'incidenza dei traumatismi del distretto cefalico sia elevate, il coinvolgimento delle vie lacrimali risulta essere una condizione associate non frequente. La struttura maggiormente interessata è il canalicolo inferiore. Data la particolare localizzazione di questi elementi, il loro coinvolgimento avviene di solito in caso di traumi che determinino profonde lesioni in presenza o assenza di fratture associate. La ricostruzione del distretto cefalico comporta l'importante ripristino della componente morfo-funzionale e dunque sarà importante individuare un eventuale coinvolgimento delle strutture lacrimali nel caso di traumi facciali per un corretto ripristino delle aree interessate dal trauma. Per la localizzazione della lesione possiamo sia incannulare le strutture o instillare

un collirio alla fluorescina a livello congiuntivale. Il paziente con trauma facciale deve essere sempre gestito come un politraumatizzato e pertanto è necessario valutare e trattare altre lesioni associate che potrebbero rappresentare un rischio per la sua stessa vita (traumi addominali, lesioni organi interni, etc.). Nei casi in cui ci siano solo lesioni profonde, il trattamento chirurgico dovrebbe essere iniziato entro 12-48 ore per migliorare al massimo il risultato; quando, invece, ci sono anche fratture associate, allora l'intervento di ricostruzione lacrimale dovrebbe essere procrastinato dando priorità alle fratture ossee. I punti fondamentali su cui si deve basare il managment ed il trattamento di questi pazienti sono tre: il mantenimento delle funzioni vitali, il recupero della funzionalità ed il ripristino dell'equilibrio morfo-funzionale precedente al trauma.

### References

1. Gassner R, Tuli T, Hachl O, Rudisch A, Ulmer H: Craniomaxillofacial trauma: A 10 year review of 9,543 cases with 21,067 injuries. J Maxillofac Surg, 2003; 31(1):51-61.

- 2. Raja Kummoona: *Management of maxillofacial injuries in Iraq*, J Craniofacial Surgery, 2011; 22:1561-566.
- 3. Ghysen D, Ozsarlak O, van den Hauwe L, Van Goethem J et al.: *Maxillo-facial trauma*. JBR-BTR, 2000; 83(4):181-92.
- 4. Micali G, Scuderi N, Moschella F, Soma PF: I tumori delle pal-

pebr, in Micali G, Scuderi N, Moschella F, Soma PF: Tecniche di chirurgia ricostruttiva, vol. 2, Milano: Bold/Ad s.r.l.; 1990:63-89.

5. Monteil JP, Esnault O, Brette MD, Lahbabi M: *Chirurgia dei traumi del massiccio facciale* in *EMC, Chirurgia Plastica, Ricostruttiva ed Estetica*, Parigi, Edizioni Elsevier EMC, 2003.

6. Scuderi G: *Chirurgia plastica della regione orbitaria.* Edizione Minerva Medica, 1975.

7. Walter C: Problems in reconstruction of the inner canthus and the lacrimal duct. J Maxillofac Surg, 1976, 4:34.

8. Zolli CL: *Microsurgical repair of lacrimal canaliculus in medial canthal trauma.* in Hornblass A: *Oculoplastic, orbital and reconstructive surgery.* vol. 1, Balti more: Williams and Wilkins, 1988.

9. Jing-Wei Lee: Nasolacrimal duct reconstruction with nasal mucoperiosteal flap. Ann Plastic Surgery, 2007; 59:143-48.

10. Ted T Huang, Kengi Sasaki, Motohiro Nozaki: *Reconstruction of the lacrimal excretory system.* Presented at Ann Meeting of the A.S.P.R.S., Boston, October 21-25, 1990.

11. Marciani RD, Gonty AA: Principles of management of complex craniofacial trauma. J Oral Maxillofac Surg, 1993; 51(5):535-42.

12. Holtmann B, Wray RC, Little AG: *A randomized comparision of four incision for orbital fractures.* Plast Reconstr Surg, 1981; 67:731-35.

13. Merville LC, Real JP: *Dislocations fronto-orbito-nasales. Reconstruction initiale totale. Tactique. Avantages. Servitudes.* Ann Chir Plast, 1979; 33:488-90.

14. Scuderi N, Rubino C: *Chirurgia Plastica*. Padova: Piccin Editore, 2004.