

EYELID AND ORBITAL PLASTIC RECONSTRUCTIVE SURGERY

Photographic Atlas

Serge Morax



EYELID AND ORBITAL PLASTIC RECONSTRUCTIVE SURGERY

Photographic Atlas

Serge Morax



EYELID AND ORBITAL PLASTIC RECONSTRUCTIVE SURGERY

Photographic Atlas

Serge Morax



Edition

Published by:

Laboratoires Théa

12, rue Louis Blériot

63000 Clermont-Ferrand, France

Tel.: +33 (0)4 73 98 14 36

1st Edition: March 2026

The content of this publication reflects the views of the author(s) and does not necessarily represent the opinions of Laboratoires Théa.

Contribution to the development: Peggy Chabaud (Medical Affairs Department)

Design: Print Conseil

All rights of translation, adaptation, and reproduction by any means are reserved worldwide.

No part of this publication may be reproduced or transmitted, in whole or in part, in any form or by any means, without the prior written permission of the publisher. Any unauthorized reproduction constitutes an infringement.

Exceptions are limited to private use and to short quotations justified by the scientific or informational nature of the work in which they are incorporated, in accordance with the provisions of the French Intellectual Property Code.



SERGE MORAX

Former Head of Department of Ophthalmology and
Ophthalmic Plastic Reconstructive Surgery
Rothschild Ophthalmic Foundation -Paris
Professor, College of Medicine Hôpitaux de Paris

PREFACE

THE ORIGINS OF THIS ATLAS

I stopped my activities as a surgeon and consultant five years ago and as a lecturer two years ago. During 40 years of professional activity, I presented numerous conferences in France and abroad on ophthalmic and orbital surgery. A large collection of photographic documents was accumulated over the years.

During a recent trip abroad, where I was once again presenting a few conferences, I realized, when opening my computer, the rich collection of images I possessed. I recognized that this valuable resource could be more useful if shared in the form of an Atlas accessible to all, rather than remaining dormant.

Many books, reports, and treatises have been written, often with great skill, in recent years on this surgery. So why try to start over and do better than these prestigious authors?

What attracted me was the presentation of the subject. More than the content, it was the visual format that appealed to me, richly illustrated with simplified texts and clear captions, like comic strips.

I NEEDED TO FIND A PUBLISHER

"Laboratoires Thea", represented by Henri and Jean-Frédéric Chibret, responded to my request. The project I submitted was quickly accepted. They are to be thanked wholeheartedly. They have always been present and have worked tirelessly for the development of ophthalmology, both at the laboratory level and in the dissemination of medical education.

OBJECTIVES OF THIS ATLAS

The aim is to illustrate ophthalmic plastic surgery over the past 40 years using photographic documents and surgical techniques. This work is purely personal and reflects only the author's views. The topics covered and the choice of techniques do not claim to be exhaustive like an encyclopedia. It is the work of experience, a personal journey that I learned from prestigious masters and tried to pass on to my students, both French and foreign, with the approach "How I do it". All the techniques presented have been chosen, tested, and validated through 40 years of experience.

That said, other techniques are certainly equally valid when used appropriately.

THE DEVELOPMENT OF OCULOPLASTIC SURGERY

Oculoplastic surgery, a subfield of ophthalmology, is not new. It was redefined starting in 1960 thanks to the work of renowned ophthalmologists and plastic surgeons such as J.C. Mustarde in England and Paul Tessier in France. It covers eyelid surgery: malpositions and reconstructions; lacrimal surgery; orbital pathology: thyroid orbitopathy, orbital tumours, orbital fractures, ocular motility disorders, orbital reconstructions, and recently, aesthetic surgery of the eyelids.

Oculoplastic surgery, which is constantly evolving, requires both ophthalmological and plastic surgical training. It is concerned with the content (the eye) and the container (eyelids, orbit).

I consider myself fortunate to have chosen and developed this specialty. The shift from ophthalmology to orbito-palpebral surgery is significant.

This dual affiliation comes from my family's ophthalmological background. My grandfather, Victor Morax, a Pasteurian bacteriologist who discovered *Moraxella*, became the first head of the ophthalmology department at the Paris public hospital system at Lariboisière Hospital. My father, Pierre Victor Morax, was the head of ophthalmology at St Antoine Hospital in Paris, who guided me in my early career and helped steer my path.

I owe a lot to my ophthalmological training in Paris at Hôtel-Dieu as an assistant under the leadership of Guy Offret and Yves Pouliquen, who gave me full freedom to develop my activities.

I also owe much to my meeting with Paul Tessier at Foch Hospital. I became his resident in 1976, then his oculoplastic correspondent, and soon, his loyal companion. He was a world-renowned expert in craniofacial surgery as well as in orbital-palpebral surgery. He demystified and simplified surgery, making it boundless and accessible to all those who made the effort to learn and take action.

The A. de Rothschild Ophthalmological Foundation gave me much. Appointed head of the department in 1983, I created a division dedicated to orbital-palpebral-lacrimal pathology and surgery. Supported by a "Head and Neck" hospital, I was able to carry out my activities as a clinician, surgeon, and educator to many residents, French and international visitors.

The Foundation would become the first "Head and Neck" establishment where combined orbital surgery could be performed simultaneously by multidisciplinary teams.

In 1982, the European Society of Oculoplastic Reconstructive Surgery (ESOPRS) was founded. In 1998, with J.P. Adenis, we presented the annual report of the French Society of Ophthalmology (SFO) on orbital-palpebral pathology. In 2002, The French Society of Oculoplastic, Reconstructive and Aesthetic Ophthalmology (SOPREF) was born, reflecting the growing interest of young ophthalmologists in this field.

I am an ophthalmologist by heritage, an oculoplastic surgeon by the laws of chance and an exceptional encounter. Over 40 years, I have been able to write numerous articles, contribute to many books, and present reports, all focused on the eye, its position, its protection, its appendages, and the relationships that contribute to its function, even from a distance.

This personalized Atlas is somewhat the culmination of my career, which has brought me many satisfactions. I hope it will interest a large number of readers, whether they are ophthalmologists, oculoplastic surgeons, or specialists from other fields related to the orbit. This beautiful discipline deserves to be illustrated and must take an important place in the field of ophthalmological activities.

Serge Morax

TABLE OF CONTENTS

SECTION 1: EYELIDS

Introduction

1. EYELID MALPOSITIONS	19
1.1. ENTROPIONS	20
1.1.1. Involutional entropion	21
1.1.2. Cicatricial entropion by retraction of the posterior lamella	24
1.1.3. Congenital entropion	27
1.2. ECTROPIONS	28
1.2.1. Involutional ectropion: the various components	29
1.2.2. Cicatricial ectropion	32
1.2.3. Cicatricial ectropion with medial canthus avulsion	36
1.2.4. Congenital ectropion	37
1.3. PTOSIS	38
1.3.1. Levator muscle resection by anterior approach	40
1.3.2. Aponeurosis surgery	44
1.3.3. Posterior approach-Müller's resection	47
1.3.4. Frontalis suspension	49
1.4. MEDIAL CANTHOPLASTY	54
1.5. EYELID MUSCLE RETRACTIONS	60
1.5.1. Upper eyelid muscle retraction	62
1.5.2. Inferior eyelid muscle retraction	70

2. BLEPHAROPLASTY & LATERAL CANTHOPLASTY	77
2.1. BLEPHAROPLASTY	78
2.1.1. Upper eyelid blepharoplasty	78
2.1.2. Forehead and eyebrow elevation	82
2.1.3. Eyelid crease repair	85
2.1.4. Botox injection	86
2.1.5. Upper eyelid blepharoplasty and ptosis	88
2.1.6. Lower eyelid blepharoplasty	89
2.1.7. Lower eyelid lipectomy by posterior approach	90
2.1.8. Lower eyelid blepharoplasty by anterior approach	92
2.1.9. Hollow's treatment by fillers or fat transfer	94
2.1.10. Cheek lift: lower eyelid transblepharoplasty and midface rejuvenation	96
2.2. LATERAL CANTHOPLASTY	98
2.2.1. Surgery of the whole canthus	100
2.2.2. Surgery of the lower eyelid	102
3. EYELID RECONSTRUCTION	107
3.1. ANATOMY	108
3.2. GRAFTS USED IN OCULOPLASTIC SURGERY	110
3.3. FLAPS USED IN OCULOPLASTIC SURGERY	114
3.4. EYELID INJURY REPAIR WITHOUT LOSS OF TISSUE	116
3.5. EYELID AVULSIONS	118
3.6. PARTIAL THICKNESS DEFECTS	122
3.6.1. Anterior lamellar defects	122
3.6.2. Flaps to reconstruct posterior lamella	123
3.7. FULL-THICKNESS DEFECTS	124
3.8. EYELID RECONSTRUCTION IN FACIAL PLASTY	136

SECTION 2: ORBIT

Introduction

1. ORBITAL SURGICAL APPROACH	141
1.1. INDICATIONS AND OPERATIVE PRINCIPLES	144
1.2. MAIN APPROACHES AND OSTEOTOMY	146
1.3. SUPERIOR APPROACH	148
1.4. INFERIOR APPROACH	150
1.5. LATERAL APPROACH	152
1.6. CONJUNCTIVAL APPROACH	154
1.7. CORONAL APPROACH	158
 2. ORBITAL TRAUMA AND ORBITAL FRACTURES	 161
2.1. EMERGENCY	162
2.2. DIFFERENT TYPES OF ORBITAL FRACTURES	164
2.3. DIPLOPIA	166
2.4. MANAGEMENT OF ORBITAL FRACTURES	168
2.5. SURGICAL APPROACH TO THE ORBITAL FLOOR	170
2.6. OPERATED FRACTURES AND DIPLOPIA PROBLEMS	174
2.7. UNOPERATED ORBITAL FRACTURES	176

3. ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY	181
3.1. POST-ENUCLEATION SOCKET SYNDROME	184
3.2. EYELID MALPOSITIONS AND SOCKET	188
3.3. IMPLANT EXTRUSION	190
3.4. CONTRACTED SOCKET	192
3.5. ORBITAL RECONSTRUCTION AFTER EXENTERATION	198
3.6. ANOPHTHALMOS AND SEVERE CONGENITAL MICROPHTHALMOS	200
3.7. SOCKET PROBLEMS WITH EYELID MALFORMATIONS	204
3.7.1. Microphthalmos with lower eyelid clefts	204
3.7.2. Cryptophthalmos syndrome	205
4. SURGERY OF DYSTHYROID ORBITOPATHY	209
4.1. GENERAL CONSIDERATIONS	210
4.2. DIFFERENT ASPECTS	210
4.3. EVALUATION	212
4.4. IMAGING	212
4.5. MANAGEMENT	215
4.6. SURGICAL TREATMENT	216
4.6.1. Decompression	216
4.6.2. Squint surgery	221
4.6.3. Eyelid surgery	224
4.7. CASE REPORTS AND RESULTS	226

Section

1

EYELIDS

GENERAL CONSIDERATIONS BASIC PRINCIPLES IN ORBITAL EYELID SURGERY

Some general principles are essential to know before operating on the area of the orbit and eyelid.

Rich facial vascularization allows for bold autoplasties

It is necessary to be **as conservative as possible** and to remove a minimal amount of tissue in case of facial wound.

Autoplastic repair of the soft tissues should be preceded by putting the underlying bone elements back in place.

Eyelid reconstruction should favor local flaps (of the same tissue texture) over regional flaps. Transplants should be from eyelid to eyelid.

The concept of facial territorial units is also important to know.

A preoperative work-up is essential. Any treatment or condition must be reported.

The patient should be informed and prepared for the type of procedure.

The consultation will be supplemented by photographic documents or pre, intra, and postoperative video.

The type of anaesthesia after consultation is discussed depending on the pathology: local anaesthesia, with or without sedation for “dynamic surgery” such as ptosis to allow for better control of dosage; general anaesthesia in major orbital surgery of tumours and reconstructions.

During the procedure, the patient must be **properly set up**. Some techniques such as **neuronavigation** can help to improve conditions of visualisation in the orbital cavity. Access to intraoperative imaging is essential. **Surgical drapes** are arranged to allow maximum visibility of the approaches, which are dependent on the pathology and procedure in question. **Tissue injection** with xylocaine adrenaline provides both local anaesthesia and tissue distension, which simplifies dissection and the dissection planes as well as haemostasis. **Incisions** are made by cold Parker 15 scalpel or by electric scalpel in sectioning mode or by CO2 laser handpiece. **Haemostasis** must be perfect using a mono or bipolar electric scalpel. **Tissue reconstruction** (see Eyelid Reconstruction chapter) assesses the loss of substance by looking for conjugate points (anatomical eyelid reference points) by specifying the significance of the deficit in terms of height and length, the issue involved, superficial, deep, or full thickness.

Sutures according to situation, type, material influence the result. Closure of the deep planes is done by absorbable sutures (Vicryl 4/0 to 6/0). For skin sutures, use 6/0 silk (or rapid-absorption Vicryl 6/0, Prolene). Removal is done between day 5 and 8.

Instrumentation. Some instruments are essential. For example: 2-mL or 5-mL syringes with thin 25- or 30-gauge needles for injection; electric scalpel with mono- or bipolar forceps; aspiration; dissecting forceps with and without hooks; Gillies hooks; retractors with and without hooks; Desmarres retractor; set of scissors of various sizes with blunt and sharp tips; haemostasis forceps. Orbital surgery uses malleable blades to expose the bone walls; raspatories for bone detachment and dissection; osteotomes for bone deposits. A motor adaptable to various handpieces is required for bone surgery.

01

EYELID MALPOSITIONS

1.1. ENTROPIONS

Entropion is a malposition of the eyelid that results in the free edge of the lower eyelid (more rarely the upper eyelid) turning toward the eyeball.

There is a difference between acquired entropions, which are primarily involutional and sometimes cicatricial, and congenital entropions, which are rarer and differ from epiblepharons (which disappear with growth).

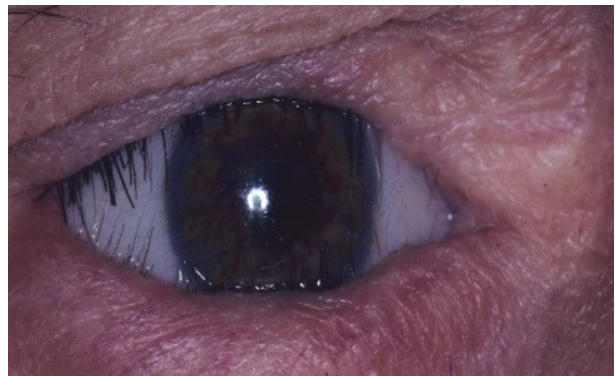
Examination must study the various pathogenic factors that can explain the entropion migration of the preseptal orbicularis muscle over the pretarsal muscle laxity of the lid retractors, allowing the lower border of the tarsal plate to rotate outwards tarsal plate modification as atrophic changes and bends or thickness and scar horizontal laxity.

Surgical treatment will affect all pathogenic factors.

Various appearances of entropions



Involutional entropion



Cicatricial entropion



Congenital entropion



Epiblepharon (disappeared with time)

1.1.1. INVOLUTIONAL ENTROPION

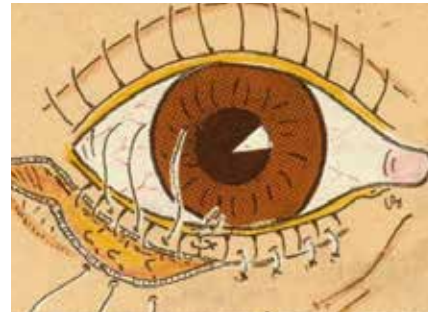
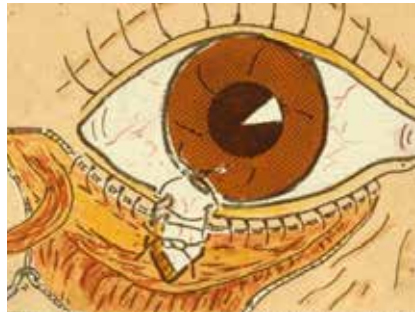
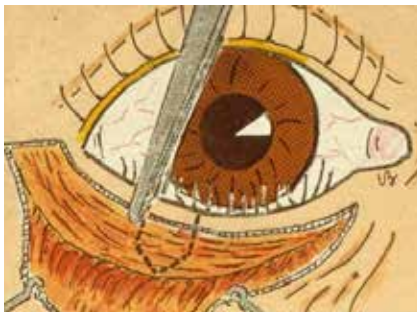
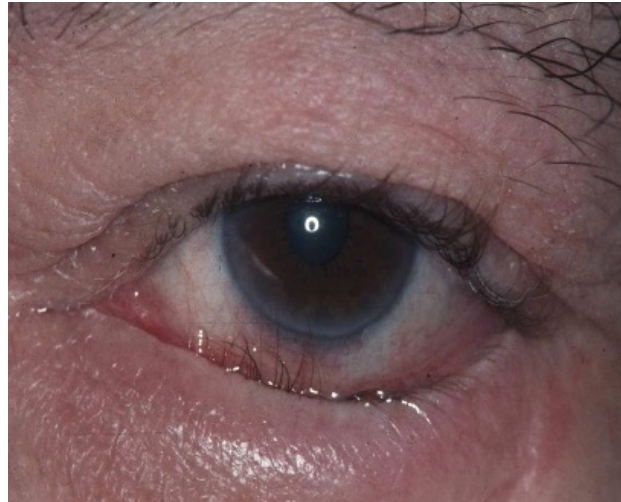
The most common type of entropion

PATHOPHYSIOLOGY

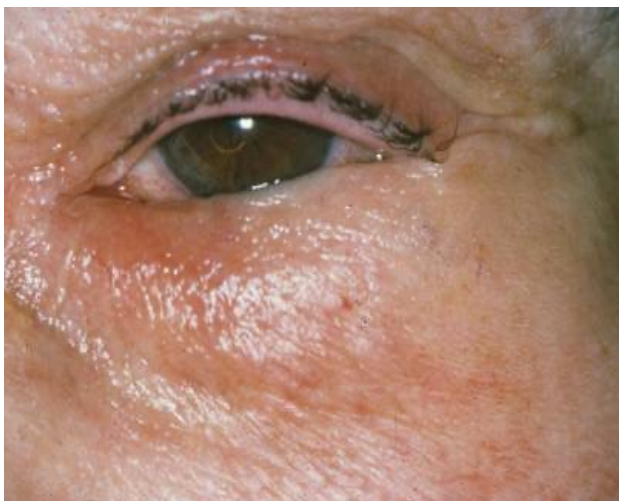
- Horizontal and vertical laxity
- Release of the lateral canthal tendon
- Preseptal to pretarsal orbicular migration

TREATMENT

- Horizontal and vertical tissue trimming
- Restore tension to the lateral canthal tendon
- Reposition the orbicularis with everting sutures



*Trimming of the free edge-resection of the pretarsal orbicularis – everting sutures**



Involutional entropion



Post-operative appearance

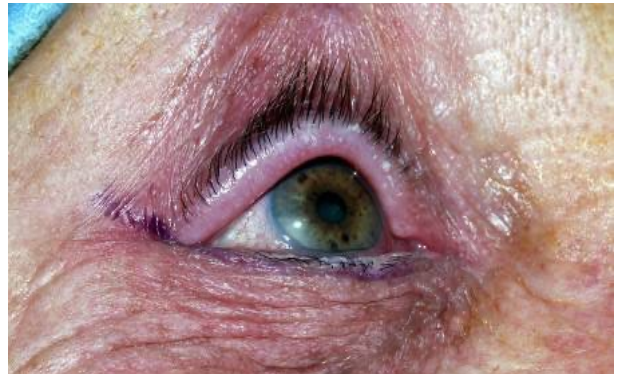
* [Ref: personal]

01 EYELID MALPOSITIONS

Involucional entropion surgery: action on the various components



Entropion



Location of the subciliary incision



Vertical laxity



Horizontal laxity



a - Anterior approach



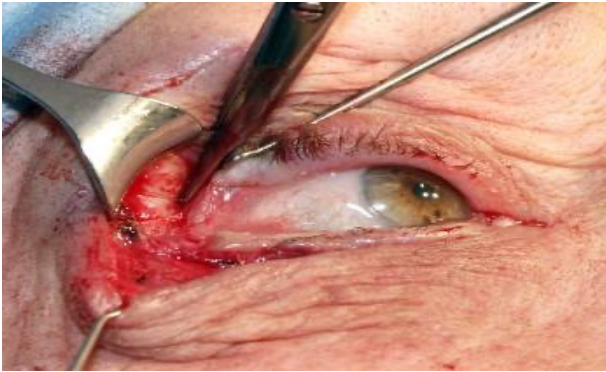
b - Detachment of the free edge



c - Trimming of the free edge



d - Tarsal neotendon creation



e - Canthal tendon detachment



f - Connection of the neotendon to the periosteum



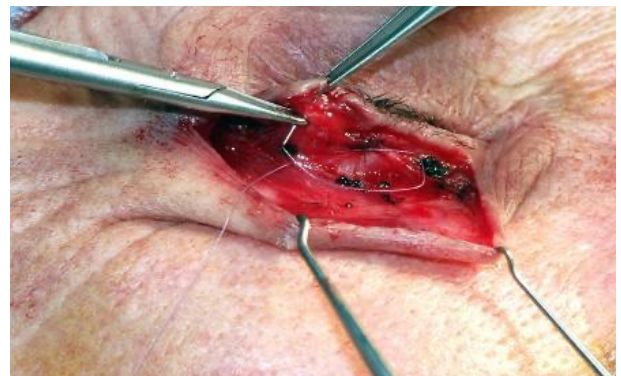
g - Excess skin lift



h - Excess resection



i - Canthal fixation of the free edge



j - Deep everting sutures



k - Deep everting sutures 6/0



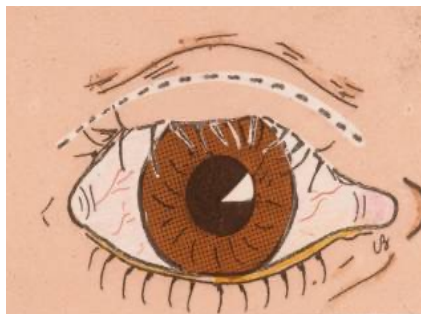
l - Skin sutures 6/0

01 EYELID MALPOSITIONS

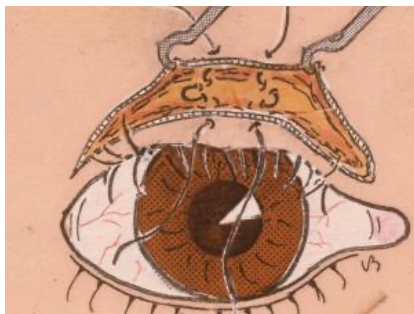
1.1.2. CICATRICAL ENTROPION BY RETRACTION OF THE POSTERIOR LAMELLA SURGICAL INDICATIONS

- **Grade 1:** Everting sutures
- **Grade 2:** Tarsotomy and everting sutures
- **Grade 3:** Tarsotomy, posterior lamella lengthening
Composite graft, everting sutures
- **Grade 4:** Marginoplasty

Grade 1: cicatricial entropion everting sutures



a - Cutaneous incision 3 mm above the margin*



b - Everting sutures*

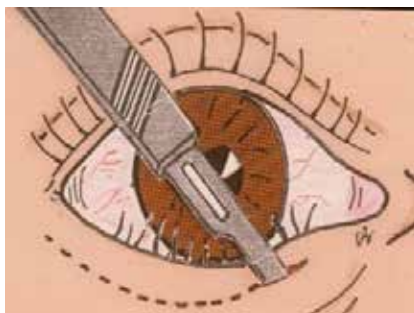


Everting sutures via anterior approach with deep fixation of the two myocutaneous flaps against the epitarsal*

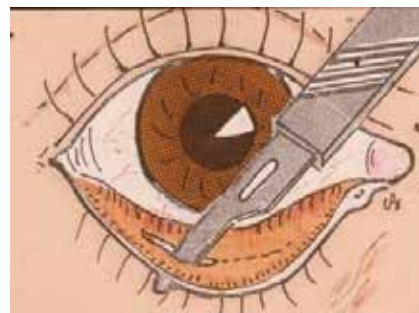
Grade 2: cicatricial entropion Tarsotomy with everting sutures



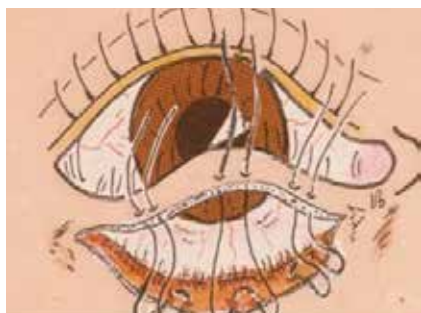
a - Cicatricial entropion



b - Anterior incision 3 mm below the margin*



c - Posterior tarsotomy*



d - Marginal flap*



e - Everting sutures fixed just below the lower fragment of the tarsal plate*

* [Ref: personnal]

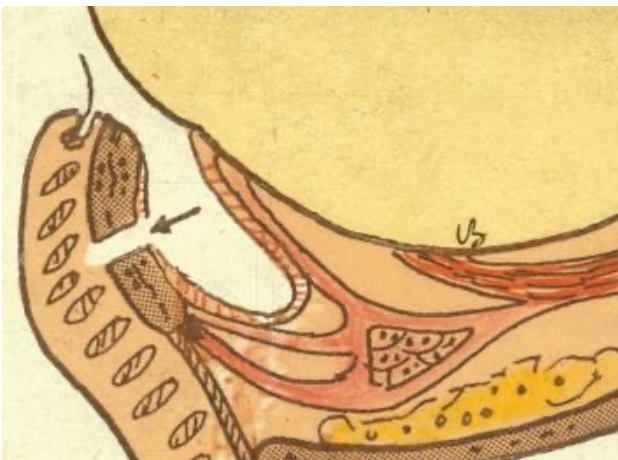
Grade 3: cicatricial entropion Posterior lamellar lengthening with composite graft and everting sutures



*Severe cicatricial entropion –
eyelashes against the eyeball*



*a - Posterior lamellar lengthening
by cartilage graft*



*Posterior tarsotomy**



b - Graft fixation by anterior approach



c - Everting sutures

** [Ref: personal]*

01 EYELID MALPOSITIONS

Grade 4: marginoplasty-mucosal graft anterior lamellar reposition

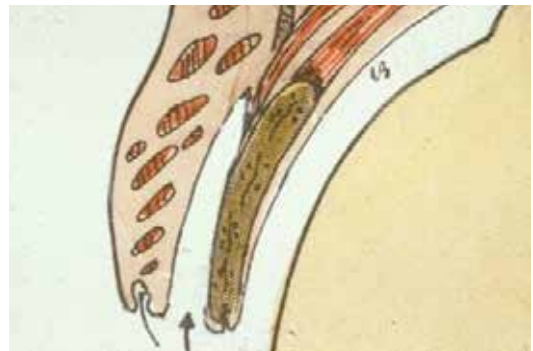
The lid is split into anterior and posterior lamella.

The posterior lamella is advanced and held in position with sutures passed through the lid.

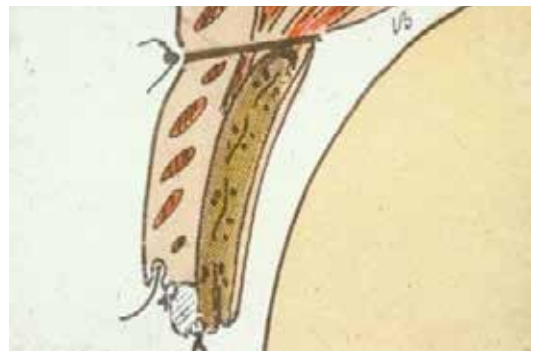
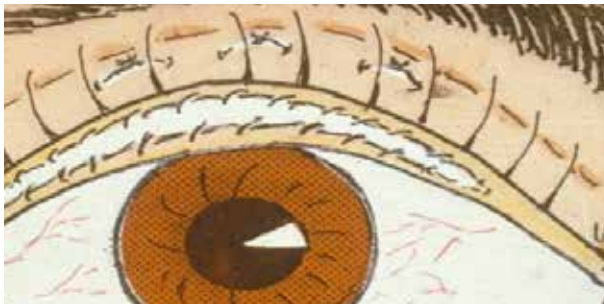
The anterior tarsal surface is covered with a mucosal graft.



Major cicatricial entropion with distichiasis



*Anterior-posterior lamellar division**

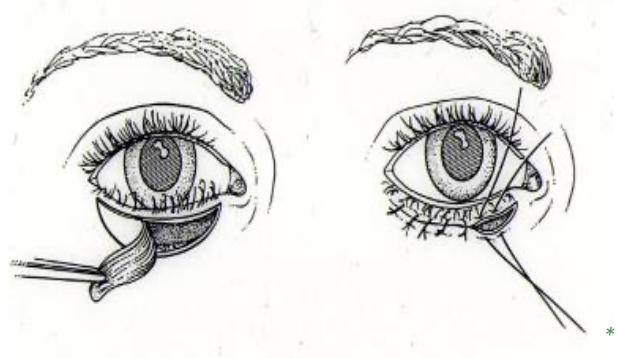
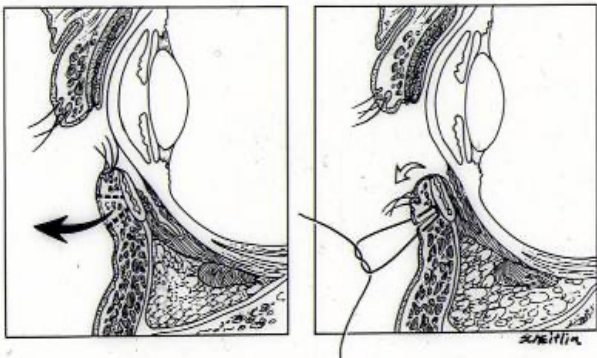


*Mucosal graft covering the tarsal plate**

* [Ref: personal]

1.1.3. CONGENITAL ENTROPION

Excision of a myocutaneous flap–Deep fixation of the two myocutaneous flaps against the epitarsal using everting sutures.



a - Excision drawing



b - Myocutaneous excision



c - Deep everting sutures



d - Vicryl 6/0 skin sutures



Pre-op



Post-op

* [Ref: personnal]

1.2. ECTROPIONS

Ectropion results in eversion of the free edge of the eyelid that loses contact with the eyeball. It can affect both the lower and upper eyelid. It typically affects adults more than children.

There are several etiological groups: acquired ectropions which are primarily involutional but also cicatricial, paralytic, mechanical, by dermatosis. Congenital ectropions are a separate, uncommon entity and are often associated with other malpositions such as ptosis.

The physical examination includes quantification of the ectropion as minimal, moderate, major its topography as total or segmental, lacrimal evaluation of tarsal and canthal laxity (horizontal) evaluation of vertical laxity which may highlight detachment of the retractors.

Examination of the skin looks for retraction of the anterior lamella.

Surgical treatment acts on the various pathogenic components.

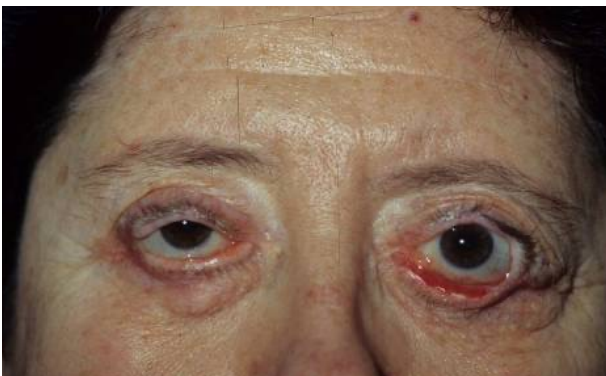
Ectropion: classification



Involutional ectropion



Cicatricial ectropion



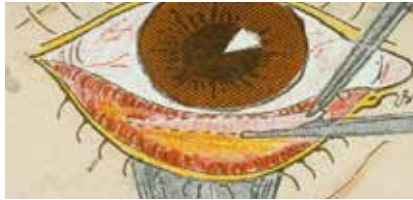
Internal ectropion-canthal dystopia



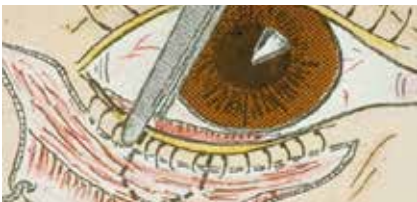
Ptosis-Congenital ectropion

1.2.1. INVOLUTIONAL ECTROPION: THE VARIOUS COMPONENTS

- Pre-tarsal orbicular involution
- Excess posterior lamella
- Horizontal laxity
- Release of the lateral angle
- Secondary skin retraction



*Detachment of retractors – excess posterior lamella = shorten the posterior lamella**



*Horizontal laxity = Full-thickness resection –external skin excision**

Standard involutional ectropion

Treatment is identical to involutional entropion except orbicularis weakening and the absence of everting sutures.



a - Search for laxity



b - Location of incision



c - Incision



d - Submuscular detachment

* [Ref: personal]

01 EYELID MALPOSITIONS



e - Free edge excision



f - Creation of a neotendon



g - Connection of the neotendon



h - Traction of the neotendon



i - Fixation of the neotendon



j - Sutures with skin surgery



k - Standard involutional ectropion



l - Result after free edge shortening – external fixation – skin surgery

Major involutional ectropion

MANAGEMENT

- Posterior excess lamellar resection
- Anterior lamellar reconstruction by graft or flap
- Lateral canthus refixation



Major ectropion – excess posterior lamella – angle release



Trimming of the free edge



Skin graft



Result after posterior lamella resection – trimming of the free edge – external fixation of the skin graft



Fixation of the graft and lateral canthus

1.2.2. CICATRICIAL ECTROPION

AETIOLOGY: SHORTAGE OF SKIN

- Traumatic, burns
- Secondary skin retractions

MANAGEMENT

- Linear and vertical scars: lengthening by Z-plasty
- Anterior lamellar deficit: flap or graft reconstruction



Traumatic ectropion

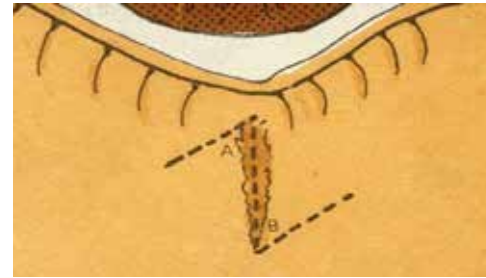


Dermatosis with cicatricial ectropion

Vertical and linear scars: lengthening by Z-plasty



Vertical scar



*Z-plasty
Reversal of flaps A and B**



Double Z-plasty with inversion of the flaps on a vertical scar



Pre-op

Post-op



Pre-op

Post-op

* [Ref: personal]

Cicatricial ectropion with buphthalmos

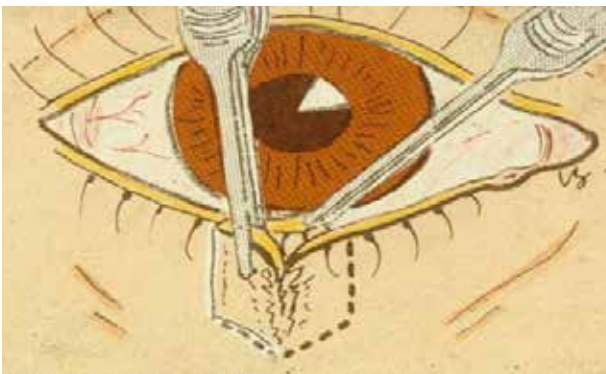
- Treatment: Evisceration – aesthetic contact lens
- Pentagonal resection of the scar and reconstruction of the margin



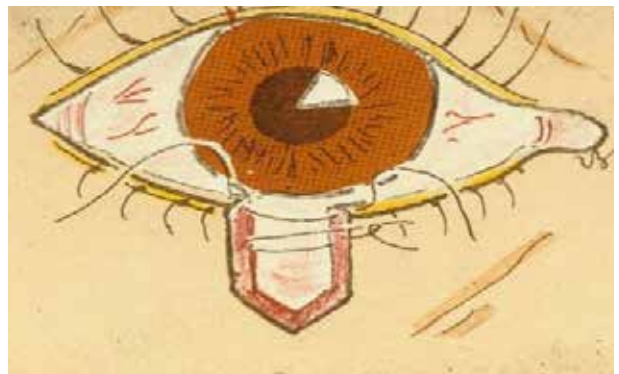
Scar, full thickness pentagonal resection



After resection-reconstruction of the two lamella (tarsus-skin orbicularis) and the margin (Vicryl 6/0 and silk)



*



*

* [Ref: personal]

Cicatricial ectropion due to skin deficit Treatment with skin graft



Cicatricial ectropion by skin retraction



Total retroauricular skin graft



Postoperative period after retroauricular skin graft

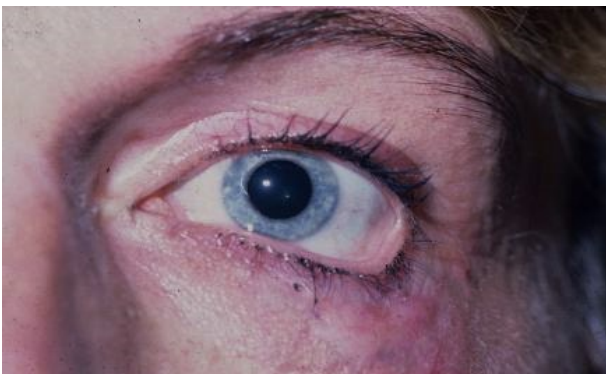
Cicatricial ectropions post blepharoplasty Correction by total skin graft



Pre-op



Post-op



01 EYELID MALPOSITIONS

1.2.3. CICATRICAL ECTROPION WITH MEDIAL CANTHUS AVULSION

PITFALLS

Control the inferior lacrimal canaliculus to avoid transection. If necessary, perform intubation or bypass in a second stage.



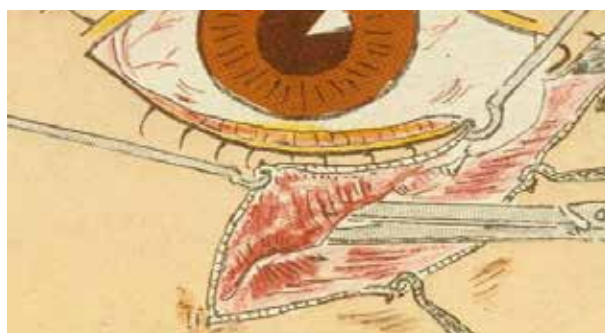
Ectropion by detachment of the medial angle



Post-op – scar revision – internal blepharoplasty



*a - Scar detachment**



*b - Scar dissection**



*c - Internal blepharoplasty: fixation of the tarsus to the medial canthal tendon**



*d - Suture**



Ectropion by detachment with vertical scarring



Result after reconstruction



Scar revision – multiple Z-plasties

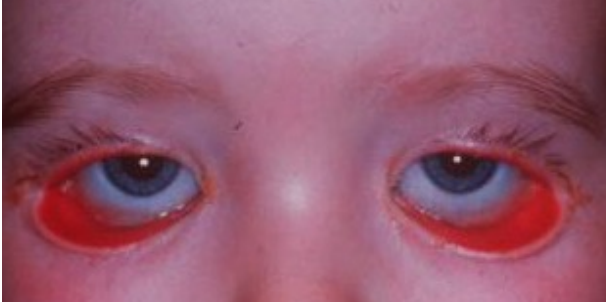
** [Ref: personal]*



After inversion of the flaps and internal blepharoplasty

1.2.4. CONGENITAL ECTROPION

- Anterior lamella deficit
- Excess length
- Frequent associated ptosis



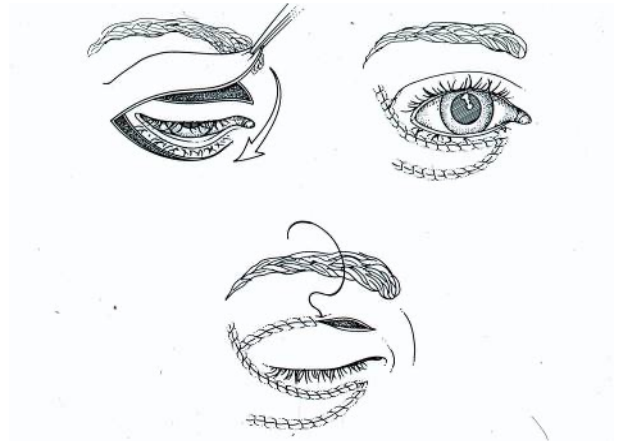
Congenital ectropion in four eyelids with ptosis



*Total skin transplant of the lower eyelids – 3 months post-op
Upper eyelid graft at Day 6
Ptosis to be treated later by suspension*



Moderate congenital ectropion



*Reconstruction of the anterior lamella deficiency
by upper eyelid flap with external pedicle**



Moderate ectropion – excess length



*Correction by transposition of upper eyelid flap
to lower eyelid and lateral canthoplasty*

* [Ref: personal]

1.3. PTOSIS

Ptosis is, by definition a drooping of the upper eyelid due to a dystrophic levator muscle in the majority of cases.

Non-dystrophic ptosis includes other causes such as aponeurotic defects and nerve palsies. After birth, we consider that ptosis is acquired and corresponds to multiple causes. The management of ptosis depends on diagnosis and examination findings.



Various forms

CONGENITAL PTOSIS

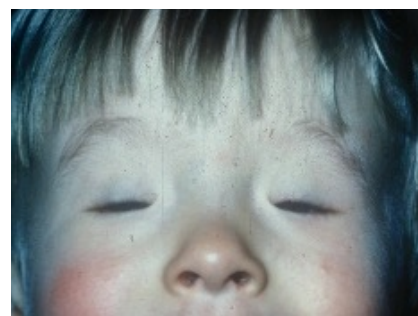
- Dystrophic
- Non-dystrophic



Unilateral right major ptosis



Double major ptosis



Blepharophimosis

ACQUIRED PTOSIS

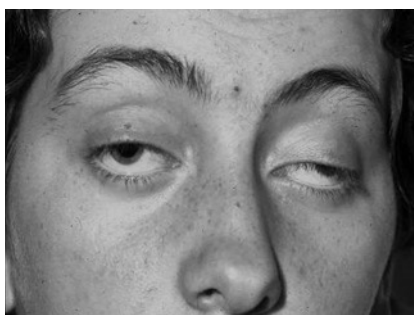
- Aponeurotic

- Myogenic
- Neurogenic

- Traumatic
- Mechanical



Aponeurotic ptosis



Myogenic ptosis



Traumatic ptosis

Examination

- History
- Degree of ptosis
- Eyelid fold
- Levator function
- Lid position in downgaze
- Eye motility – Bell's phenomenon
- Lacrimal secretion
- Associated signs



Levator function :

- good: 8–14 mm
- moderate: 5–7 mm
- bad: 2–4 mm

Operative procedures



a - Levator resection – Anterior approach



b - Aponeurosis surgery



c - Müller's resection – Posterior approach



d - Frontalis suspension

Indications for ptosis surgery dependent on levator function

LEVATOR FUNCTION (LF)

- LF > 10 mm
- Degree of ptosis:
 - inferior 2 mm: Müller's resection
 - superior 2 mm: aponeurosis surgery
- LF < 10 mm
 - LF superior 4 mm: levator resection
 - LF inferior 4 mm: brow suspension

01 EYELID MALPOSITIONS

1.3.1. LEVATOR MUSCLE RESECTION BY ANTERIOR APPROACH

This technique is used when there is levator function.

Four main groups of ptosis can be defined:

Major ptosis with poor levator function is corrected by a 22–26 mm resection.

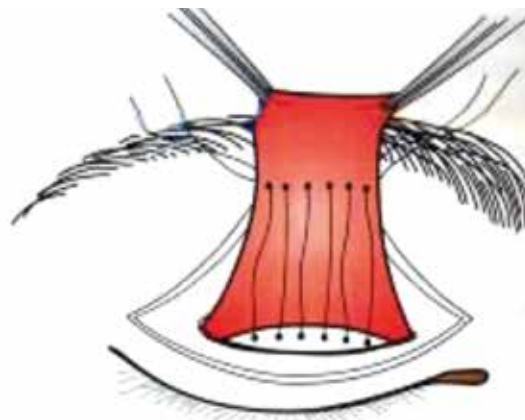
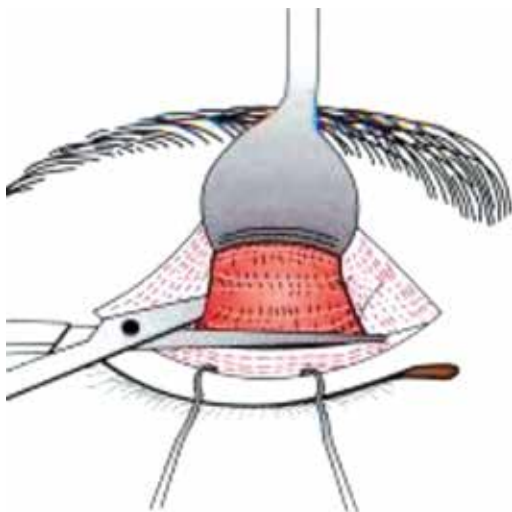
The lid margin must be at the limbus under general anaesthesia.

Minor ptosis with good levator function is corrected by a 10–12 mm levator resection.

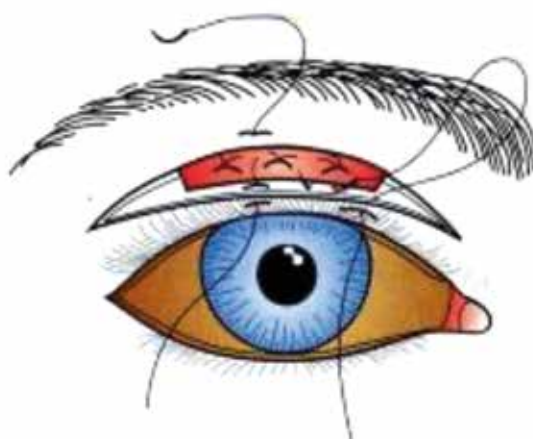
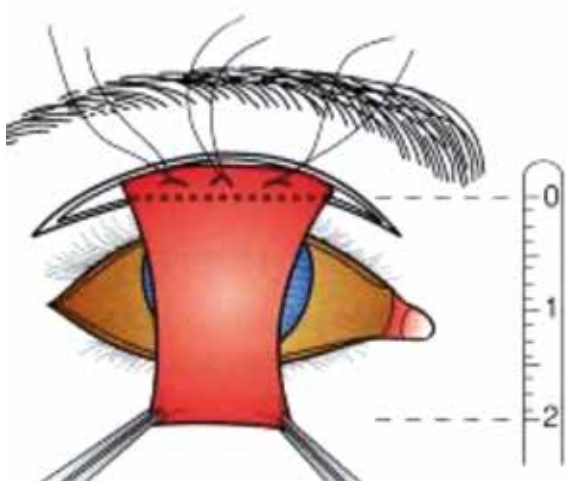
Moderate ptosis with good levator function is corrected by a 14–17 mm levator resection.

Moderate ptosis with moderate levator function is corrected by a 17–22 mm levator resection.

These measurements are approximate.



*



*Levator resection by anterior approach**

* [Ref: SFO report 1998]

Ptosis – shortening of the levator via anterior approach



a - Eyelid fold



b - Injection



c - Incision



d - Skin-orbicular detachment



e - Septum exposure



f - Opening of the septum



g - Preseptal orbital fat



h -

01 EYELID MALPOSITIONS



i - Anterior levator



j - Posterior levator



k - Shortening



l - Levator fixation to the tarsus



m - Shortening of the levator



n - Levator resection



o -



p - Suture of the levator to the upper edge of the tarsus



q - Fold and curvature control



r - Fold reformation



s - Vicryl 6/0 skin sutures



t - Moderate left ptosis



u - Result after resection of the levator



v - Moderate right ptosis

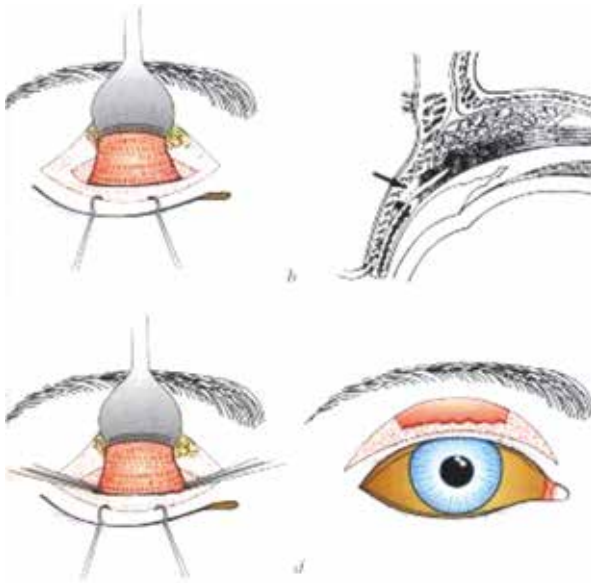


w - Postop after resection of the levator

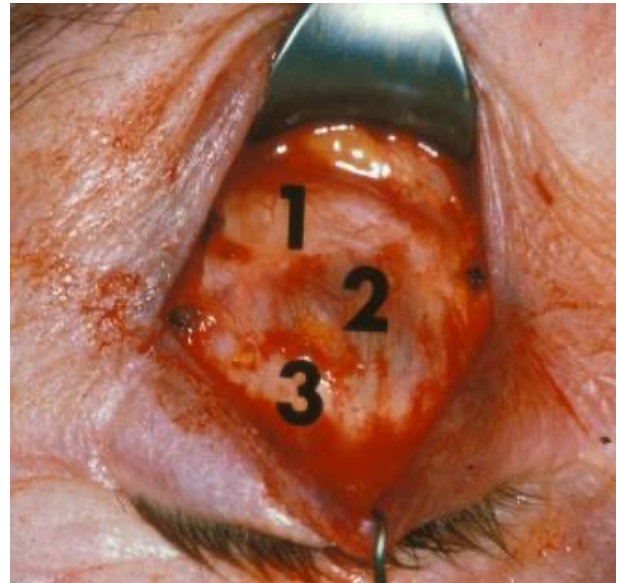
1.3.2. APONEUROSIS SURGERY

INDICATION

- Involutional ptosis
- Ptosis by aponeurotic detachment
- Good muscle function



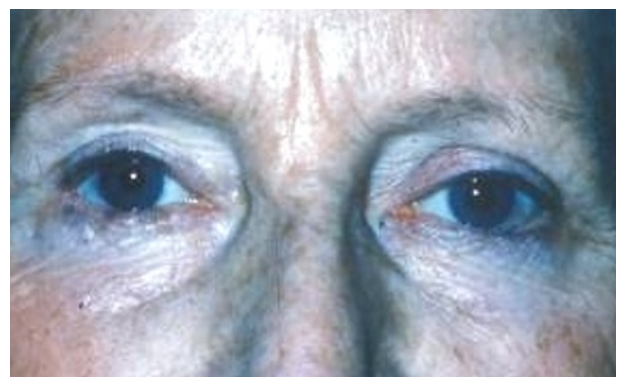
*



- 1: Aponeurotic detachment
- 2: Area of detachment
- 3: Upper edge of the tarsus



Right ptosis by detachment



After reinsertion

* [Ref: SFO report 1998]

Aponeurotic reinsertion



a - Blepharoplasty



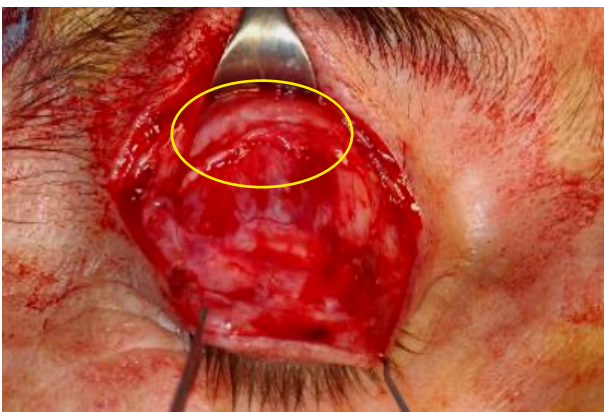
b - Skin resection



c - Septal opening



d - Preaponeurotic fat pad



e - Locating of fascia



f - Pinching of aponeurosis

01 EYELID MALPOSITIONS



g - Repositionning the aponeurosis to the tarsus



h - Suturing the aponeurosis



Aponeurotic traumatic ptosis – after reinsertion

1.3.3. POSTERIOR APPROACH-MÜLLER'S RESECTION

INDICATIONS

Minor ptosis reacting to Neosynephrine



*Left aponeurotic ptosis
Frontal hyperactivity – eyelid hollowing*

*After Neosynephrine instillation:
1: disappearance of ptosis
2: frontal muscle release
3: hollow filling*

Müller muscle-conjunctival resection



a - Pre-op



b - Conjunctival approach



c - Injection of the upper edge of the tarsus



d - Opening of the conjunctiva

01 EYELID MALPOSITIONS



e - Detachment of the conjunctival-Müller flap



f - Traction of the flap



g - Müller exposure and resection



h -



i -



j - Suture by monofilament 6/0 suture



Left acquired ptosis



8-mm Müller resection

1.3.4. FRONTALIS SUSPENSION

INDICATIONS

Major ptosis due to levator deficiency.

AUTOGENIC MATERIALS USED

- Fascia lata ++++
- Temporal fascia

SYNTHETIC MATERIALS

- Polytetrafluoroethylene (PTFE)
- Mersilene mesh
- Silicone



Major left ptosis



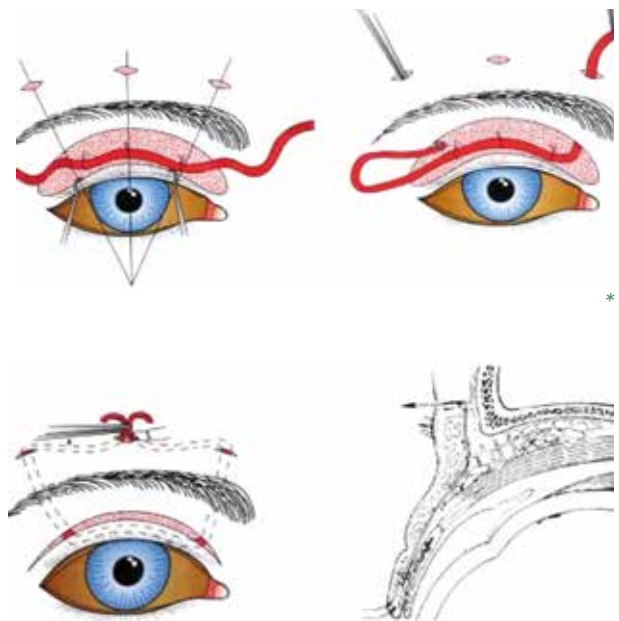
Double ptosis



Autogenous fascia lata



PTFE sling



*Frontal suspension**

* [Ref: SFO report 1998]

01 EYELID MALPOSITIONS



a - Tracing of incisions



b - Eyelid incision



c - Deep detachment to the tarsus



d - Attachment of wire to the tarsus



e - Tab attached to tarsus



f - Traction of the tabs and verification of the curvature



g - Deep passage of tabs



h - Curvature and fold control



i - Deep fixation of the orbicularis to the tarsus



j - Fixation of tabs to the frontal muscle



k



l - Control of levels: the free edge should gently touch the limbus under GA (General Anesthesia)



*Major congenital ptosis
Poor function of the levator*



Result after suspension by PTFE



Frontalis suspension by fascia lata



*Bilateral asymmetric ptosis
Ectropion with excess length*



*Result: double suspension
with fascia lata - lateral canthoplasty*

01 EYELID MALPOSITIONS

Myopathic ptosis

Correction by temporalis fascia double suspension



Major ptosis: poor levator function



Result in primary position



Upgaze



Downgaze

Cicatricial ptosis



Cicatricial ptosis in post surgery



Superior fornix retraction



Mucosal graft to rebuild the superior fornix



Ptosis correction by frontal suspension with fascia lata

1.4. MEDIAL CANTHOPLASTY

Medial canthal dystopias are malformations and malpositions of the medial canthal region of congenital or traumatic origin.

The most common abnormality is epicanthus, which is often bilateral and minor.

Considered normal in newborns, it disappears in the first few years of life.

It can be considered pathological in many syndromes such as Down syndrome, blepharophimosis, etc.

Several groups can be distinguished:

- Epicanthus supraciliaris
- Epicanthus palpebralis
- Epicanthus inversus
- Epicanthus associated with ptosis such as in blepharophimosis

- Epicanthus associated with congenital syndrome such as hypertelorism
- Telecanthus (intercanthal widening) without bone abnormalities, without epicanthus such as Waardenburg syndrome
- Post-traumatic epicanthus and telecanthus.

Surgical treatment is based on Z-plasty (see eyelid reconstructions)

- Simple plasty, double Y-V plasty, double Z-plasty, double Z-plasty with advancement
- Transnasal internal canthopexy for telecanthus.

Medial canthus malpositions and malformations



Epicanthus palpebralis with strabismus



Epicanthus palpebralis with ptosis



Blepharophimosis: ptosis-epicanthus inversus



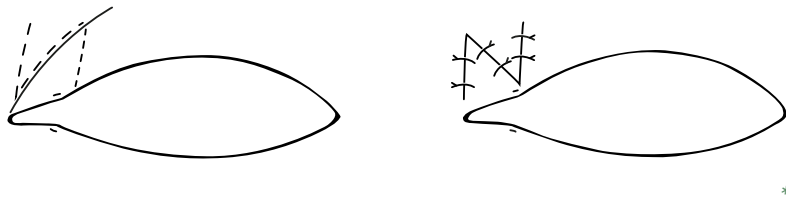
Waardenburg syndrome: telecanthus

Epicanthal folds: the Z-plasty

SIMPLE Z-PLASTY FOR EPICANTHAL FOLDS

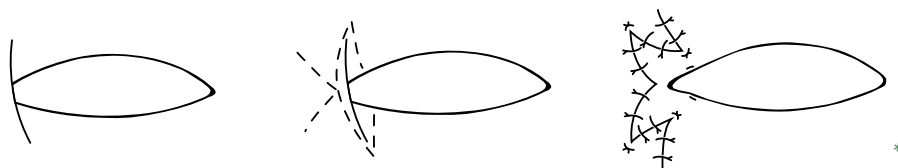
Two flaps of skin are transposed to change the line of a fold and lengthen.

- Mark the central limb of the Z in the line of the fold
- Draw the other two limbs the equal length. The shape of the Z and the angle between the limbs depend on the space available
- Transpose the flaps.



DOUBLE Z-PLASTY (SPAETH TECHNIQUE)

A separate Z-plasty is performed to lengthen and change the position of a fold affecting both the upper and lower eyelids.



Before and after strabismus surgery and double Z-plasty

* "A Manual of Systematic Eyelid Surgery", J. R. O. Collin Elsevier Health Sciences 2005

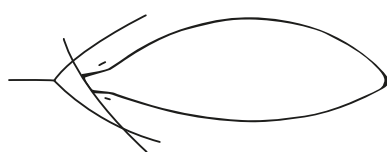
01 EYELID MALPOSITIONS

Y-V plasty

INDICATIONS

In mild epicanthus fold with telecanthus such as Waardenburg syndrome.

The canthus is advanced in a new position and the medial tendon is lengthened to correct the telecanthus.



a - Y drawing



b - Traction test: new position of the canthus, Y is transformed into V



c - Skin, an orbicularis incision



d - Medial canthus, new position



e - Deep fixation (Prolene 5/0) with shortening of the medial tendon



f - Skin suture: silk or Vicryl 6/0

Double Z-plasty (Mustardé)

A double Z-plasty and Y-V plasty are combined. The double Z-plasty lengthens and changes the position of the epicanthal fold.

The Y-V plasty corrects the telecanthus by shortening the medial canthal tendon.

INDICATION: marked epicanthal fold with telecanthus such as blepharophimosis.



a - Drawing: double Z and Y-V plasty



b - Skin and orbicularis incision



c - Deep dissection towards medial canthal tendon (MCT) insertion



d - MCT dissection and view



e - Dissection of the four flaps and the canthus in the new position (Y-V plasty)



f - New canthus fixed by 5:0 Prolene after shortening the MCT



g - Skin suture (Vicryl 6/0) after transposition of the four flaps



h - Left side: new position of the medial canthus

01 EYELID MALPOSITIONS

Blepharophimosis



Telecanthus-epicanthus-ptosis



*After correction
of epicanthus-telecanthus*



*Eight days after ptosis correction
by frontal suspension*



Severe blepharophimosis



*Result after canthus and
ptosis surgery in two stages*

Waardenburg's syndrome surgical treatment

- Medial canthal tendon shortening (Y-V plasty)
- Medial canthopexy for severe cases
- Control of lacrimal drainage.



Telecanthus



After Y-V plasty and shortening the MCT

1.5. EYELID MUSCLE RETRACTIONS

Eyelid muscle retractions are one of the most common manifestations of dysthyroid orbitopathy. They can occur in both the acute and residual injury stages of the disease, contributing to corneal exposure and the unsightly appearance of the gaze. The upper eyelid is most often involved. They are found less frequently in congenital malformations, residual injuries of facial palsy, complications of ptosis surgery. Anatomically they consist of damage to the retractors which lose their flexibility (upper, lower eyelid retractors).

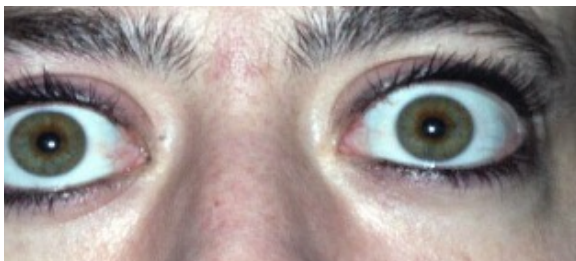
The diagnosis of eyelid muscle retraction is made in the primary position by the distance from the limbus to the eyelid margin which, in the normal subject, covers the limbus by 2 mm at the upper eyelid and gently touches the limbus at the lower eyelid. Retraction is classified as minor for a scleral show of 2 mm, moderate for 2 to 6 mm, severe for more than 6 mm.

Some examples

- In a dynamic situation, downward oculo-palpebral asynergy (poor downwards movement of the upper eyelid).
- Confirm the diagnosis and differentiate between false retractions related to exophthalmos, hypotropia of

the globe with no elevation, retractions due to shortness of the anterior or posterior lamellae.

- Surgical treatment is based on muscle lengthening depending on the extent of the retraction.



Proptosis with 4 eyelid retractions



Congenital right upper eyelid retraction



Lower right eyelid retraction with lid lag in upgaze



Diagnosis of eyelid muscle retraction



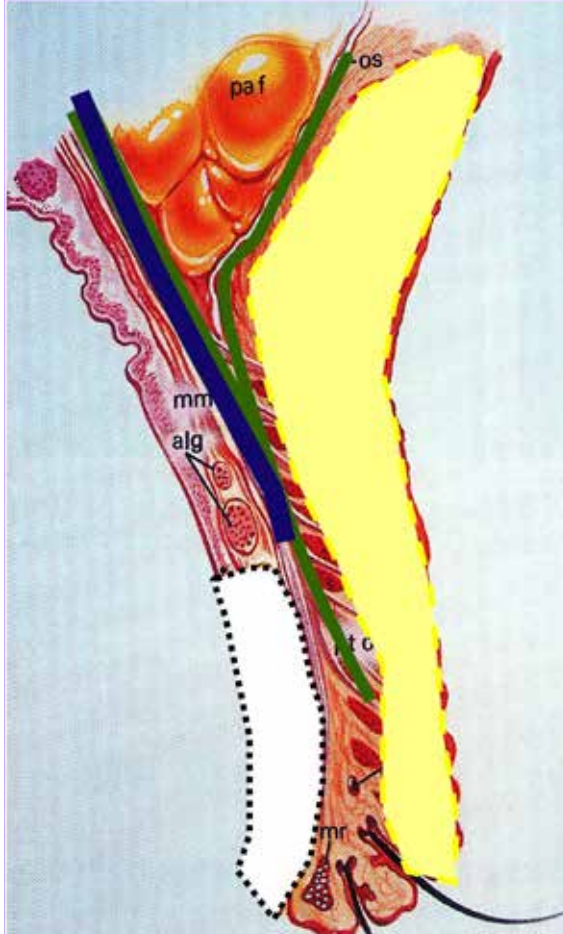
Left retraction with contralateral ptosis; the free edge reveals the limbus



Asynergy in downward gaze



Major muscle retraction with ocular-eyelid asynergy on an exophthalmos eye that increases retraction



Sagittal view of the upper eyelid with the three lamella

Eyelid retractions Anatomy and surgical principles

- Anterior lamella retraction (skin-muscle)
 - Transplants and flaps
- Mid lamella retraction (septum levator)
 - Levator lengthening
- Müller muscle retraction
 - Muscle lengthening
- Posterior lamella retraction (tarsal-conjunctival)
 - Composite grafts

01 EYELID MALPOSITIONS

1.5.1. UPPER EYELID MUSCLE RETRACTION

- Botulinum toxin (not developed)
- Posterior Müllerectomy
- Muscle lengthening with or without anterior Müllerectomy
- Muscle lengthening with interposition of autologous tissue or biomaterial

Müllerectomy by posterior approach

INDICATIONS

- Minor retraction
- Spasmodic retraction
- <2 mm

ADVANTAGES

- Predictable results
- Avoidance of hypercorrection



a - Upper eyelid eversion-anaesthesia of the posterior lamella



b - Incision at the superior border of the tarsus



c - Posterior lamella dissection



d - The conjunctiva - Müller flap



e - Separation between Müller and conjunctiva



f - Conjunctiva is preserved



g - Complete Müller dissection from the conjunctiva



h - Müller resection – conjunctiva preservation



i - In case of skin excess a blepharoplasty can be done



j - Skin resection



k - Conjunctiva running suture Vicryl 6/0



l - Skin running suture silk 6/0



Mild 2-mm left upper eyelid retraction



Result after Müllerectomy

01 EYELID MALPOSITIONS

Levator and Müller recession by anterior approach

PRINCIPLES

Cut and recess the levator twice the height the retraction.

INDICATIONS

- Moderate to major retraction
- Retraction between 2–6 mm

PITFALLS

- Control the level under local anaesthesia and if under-correction occurs cut the lateral horn and complete by Müllerectomy.



a - Skin approach in the crease



b - Open the septum



c - View of the levator



d - Levator recession



e - 10-mm recession for 5-mm retraction



f - Completion by Müllerectomy



Results: before and after surgery in the primary position and downgaze



Left upper eyelid retraction: result after 8-mm levator recession by anterior approach

01 EYELID MALPOSITIONS

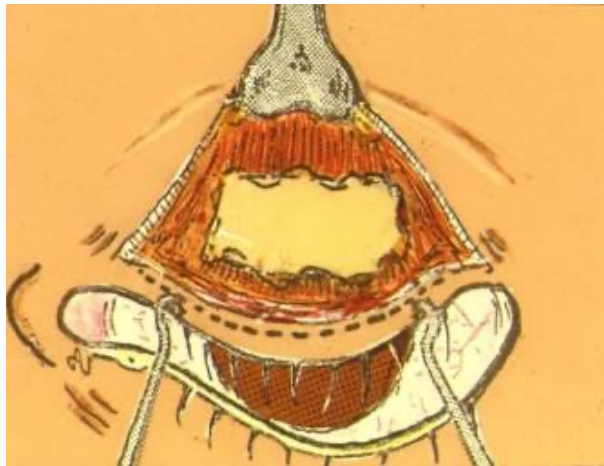
Levator recession with spacer interposition

PRINCIPLES

- Levator recession with a spacer fixed between the upper border of the tarsus and the levator
- The spacer height is double the retraction
- Various types of spacer (sclera, biomaterial cartilage, etc.)

INDICATIONS

- Major retractions >6 mm
- Significant fibrosis of the retractors
- Retraction recurrence



*



Example of a scleral patch fixed between the tarsus and levator

* [Ref: personal]

Levator recession with spacer by anterior approach



a - The approach



b - Open the septum



c - The levator and the lateral horn are cut. The Müller is resected.



d - Position of the margin before covering the spacer



e - The size of the patch is adapted in length and width.

01 EYELID MALPOSITIONS

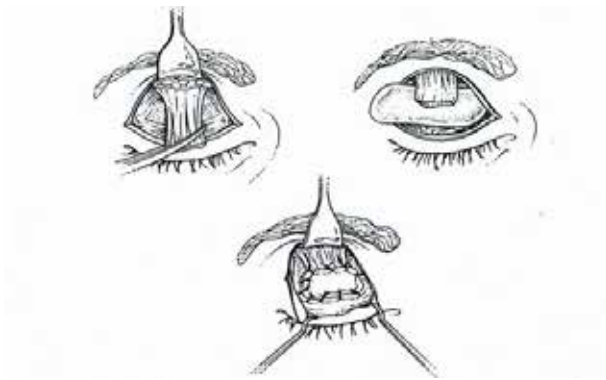


6-mm right upper eyelid retraction: result after levator recession with sclera patch 12 mm high



*Right proptosis with major retraction; result after large levator recession with spacer
Pitfalls: because the retraction increased the proptosis, the decision was made to first treat the retraction and avoid unnecessary future decompression.*

Congenital upper eyelid retraction Correction by levator recession with sclera spacer



*Technique**



Spacer between tarsus and levator



Left upper eyelid retraction 4 mm



Result with an 8-mm graft

* [Ref: personnal]

1.5.2. INFERIOR EYELID MUSCLE RETRACTION

- Recession of retractors
- Interposition of autologous tissue (mucopalatine, cartilage, dermis) or biomaterial
- Canthoplasty



Proptosis-Scleral show

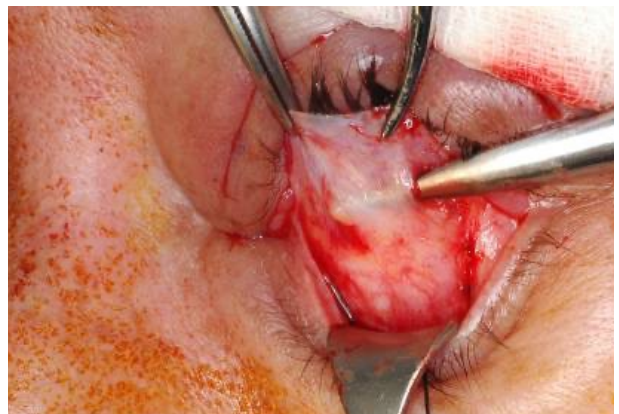
Inferior retractor recession by conjunctival approach

INDICATION

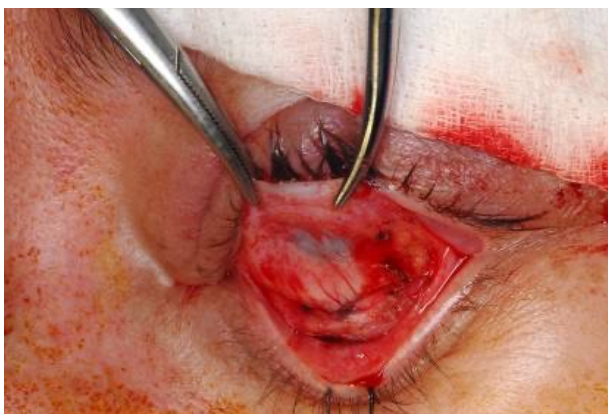
- Mild inferior retraction



a - Conjunctival incision at the inferior margin of the tarsus



b - Separate the retractors from the conjunctiva



c - The conjunctiva is free; the eyeball is visible.



d - No suture on the incision

Inferior retractor recession with spacers

PRINCIPLES

- Perform a tarsotomy by anterior or posterior approach
- Lengthen the posterior lamella using a spacer (mucosal, cartilage, dermo graft or biomaterial covered by conjunctival flap).

INDICATIONS

- Moderate to major retractions with scarring of the posterior lamella.

PITFALLS

Use a rigid graft (cartilage) more than a thin and flexible tissue (mucosa) in case of fibrosis retractions.

In case of hypocorrection combine the procedure with a lateral canthopexy.

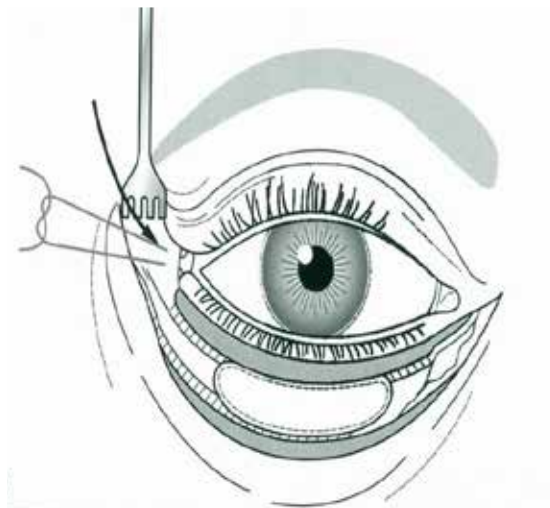
Spacers

AUTOGENOUS GRAFTS

- Mucosa thin and flexible
- Flexible dermo graft
- Cartilage more rigid and thick interesting in major fibrotic retraction
- Composite grafts.

BIOMATERIAL GRAFTS

- PTFE, Medpor®, etc.
- Risk of intolerance. Must be covered by mucosa.



*Spacer with canthopexy**



Autogenous dermo graft

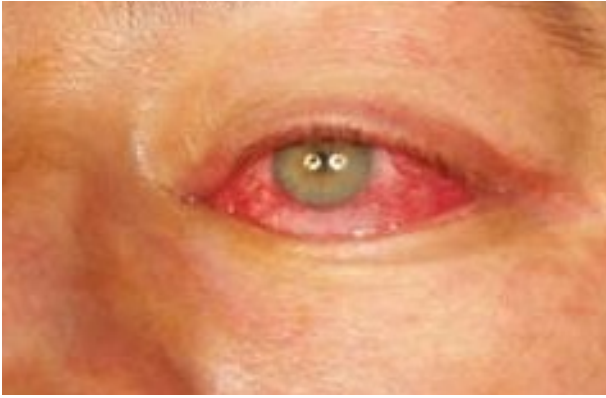


Graft in position and suture



* [Ref: personal]

01 EYELID MALPOSITIONS



*a - Major inferior retraction
With scleral show*



b - Anterior approach



c - Separation between anterior and posterior lamella



d - Tarsotomy



*e - Placement of the mucosal graft in the defect
Height is two or three times the scleral show*



f - Suture the graft to the tarsus at the inferior margin



g - Anterior view of the graft fixed by 6/0 Vicryl



*h - Posterior side of the mucosal graft
in the inferior fornix*



Scleral show post-blepharoplasty



Result after dermo graft by posterior approach with canthopexy



Major inferior posterior lamella retraction



Correction after dermo graft by anterior approach and canthopexy



Right congenital inferior retraction



Lid lag in upgaze



Result after Day 8 Dermo graft by posterior approach



01 EYELID MALPOSITIONS



Ptosis with right lower eyelid retraction



Correction of the ptosis by anterior approach – hypocorrection



Second ptosis surgery by tarsoconjunctival resection – The tissue like a composite graft was kept and transposed to the lower eyelid to correct the scleral show.



Final result



Proptosis with lower eyelid scleral show



Lower eyelid lift with spacer



*Final result
The impression of proptosis decreased*

02

BLEPHAROPLASTY & LATERAL CANTHOPLASTY

2.1. BLEPHAROPLASTY

2.1.1. UPPER EYELID BLEPHAROPLASTY

Palpebral cosmetic surgery encompasses a set of surgical procedures aimed at reshaping, repositioning, readjusting, reducing, or transplanting palpebral skin and muscular or fatty tissues, while preserving normal structure both functionally and histologically.

During blepharoplasty, additional complementary procedures can be performed either simultaneously or subsequently to enhance the final results.

These ancillary procedures may include:

- Adjunctive surgeries such as temporal forehead lift, brow lift, and cheek lift
- Treatments to reduce crow's feet, glabellar and forehead wrinkles using botulinum toxin
- Eyebrow lifting using botulinum toxin
- Filling with absorbable products (e.g., hyaluronic acid) or autologous fat (lipostructure)



*Moderate excess skin
- good crease position*



Major excess skin masking the crease



Left eyebrow elevation



Double ptosis – deep sulcus – eyebrow hyperelevation

Upper eyelid and upper face examination

- Upper eyelid
- Excess skin
- Orbicularis
- Fat
- Crease
- Deep sulcus
- Eyelid malpositions
- Forehead wrinkles
- Eyebrow position
- Lateral canthus wrinkles

Surgical indications

- Excess skin and muscle → Skin and muscle resection
- Excess preaponeurotic fat pad → Fat resection
- Excess medial fat pad
- Hollow → Hyaluronic acid and fat transfer
- Wrinkles → Superficial chemical peeling laser resurfacing
- Eyelid malposition → Ptosis and retraction correction
- Eyelid crease malposition → Skin crease reconstruction

Surgical procedures

- Simple upper eyelid blepharoplasty
- Ancillary procedures
 - Forehead and eyebrow elevation
 - Eyelid crease refection
 - Botox injection
 - Eyelid ptosis and retraction
 - Skin crease fixation
 - Hollow and deep sulcus

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

Simple upper eyelid blepharoplasty

CLINICAL PEARLS

- Design the excess skin
- Mark the upper lid crease
- Pick up excess skin and mark the upper limit
- Anaesthetize the eyelid
- Excise a strip of skin
- Orbicularis (10 mm)
- Excise excess fat
- Close the skin edge
- Remove sutures after 5–7 days



a - Mark the fold between 8–12 mm



b - Pinching excess skin



c - Skin marking 10 mm resection – The lateral and internal drawing respect the canthus



d - Local anaesthesia injection



e - Excise skin – orbicularis between the two lines



f - After excision



g - Resection



h - Open the septum to approach the internal fat pad



i - Internal fat exposure



*j - Meticulous fat resection
Avoid pre-aponeurotic fat resection*



k - 6/0 monofilament running sutures

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY



Upper lid dermatochalasis



Result at Day 7



At 2 Month



3/4 view: the dermatochalasis masks the crease.



Result at Day 7: the crease is visible.

2.1.2. FOREHEAD AND EYEBROW ELEVATION

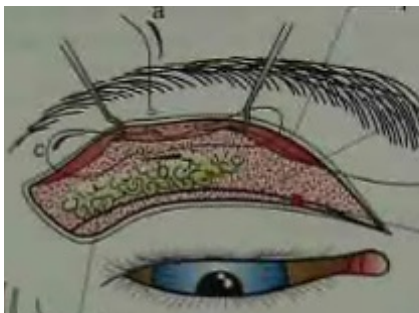
Different techniques:

- Internal browpexy
- Direct eyebrow lift
- Temporal forehead lift
- Botox injection (see 2.1.4.)

Internal browpexy by upper eyelid approach

CLINICAL PEARLS

- Fold upper eyelid excision
- Skin excision
- Deep dissection under the orbicularis muscle
- The periosteum of the superior orbital rim must be visible
- Fix the deep part of the preseptal orbicularis to the periosteum
- Intradermal running sutures



*Blepharoplasty approach**



a - Superior dissection to the roof 1-5 cm above the Supraorbital edge



*b - 4/0 non-absorbable sutures between the deep muscle
Side of the eyebrow with the frontal bone periosteum 1 cm
above the arcus marginalis*



c - Running sutures

* (Ref: personnal)



Eyebrow ptosis



Result after browpexy

Direct eyebrow lift

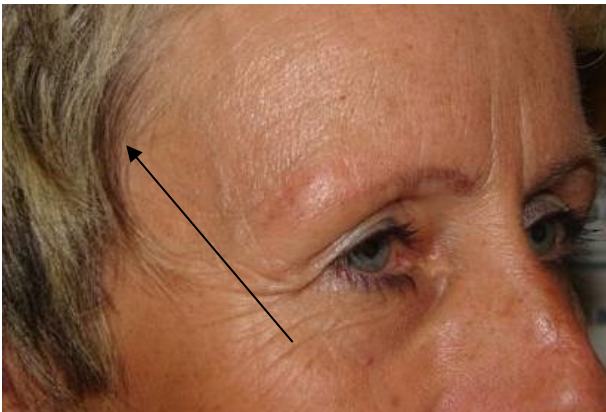
- Above-brow incision line from the medial to the lateral end of the upper eyebrow hair
- Second line parallel to the lower incision between 8–10 mm
- Excision of the strip of forehead skin and subcutaneous tissue
- Close the subcutaneous tissue with 5/0 Vicryl
- Close the skin with 6/0 running sutures



02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

Temporal forehead lift

Temporal forehead lift is used for the lateral third of the brow when there is severe laxity lateral to the brow beyond the lateral orbital rim.



Temporal and eyebrow ptosis result after temporal forehead lift

Temporal forehead lift by coronal approach

In cases of ptosis of the eyebrows and forehead, lateral hooding of the upper eyelids with short forehead and wrinkles, a coronal approach can be used. The scar is not visible.

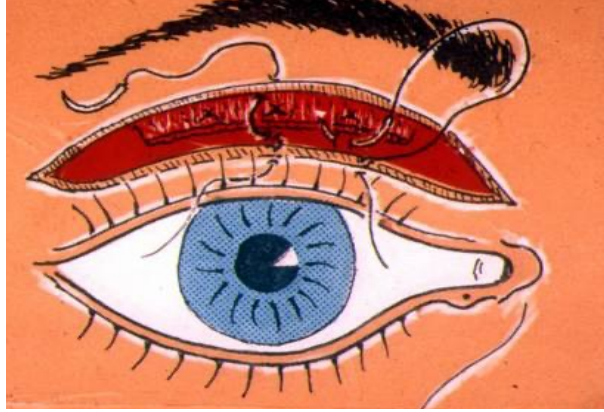


*Frontal-temporal and eyebrow ptosis
Forehead wrinkles*

*Result after frontal-temporal lift
by coronal approach*

2.1.3. EYELID CREASE REPAIR

- Incision in the crease (8–12 mm) from the margin
- Undermining deeper to the superior border of the tarsus
- Everting sutures fixing the two flaps deeper to the tarsus



*



Incision and dissection



Tarsus upper border



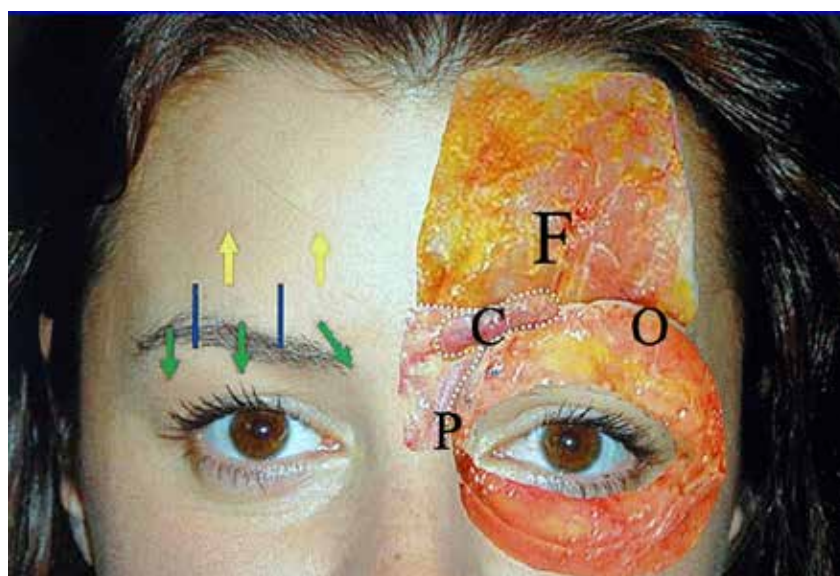
Everting 6/0 silk sutures

* [Ref: personal]

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

2.1.4. BOTOX INJECTION

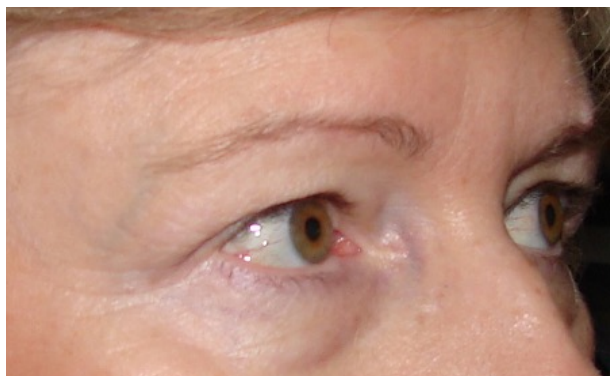
Botox injection can decrease the action of the elevators and depressors.



ELEVATORS:
Frontalis (F) Levator

DEPRESSORS:
Orbicularis (O) ↓
Corrugator (C) ↓
Procerus (P) ↓

Upper Eyelid Blepharoplasty and Botox



Dermatochalasis



Result after blepharoplasty



Frontal view: orbicularis contraction with eyebrow ptosis



Final result after Botox injection in the corrugator and orbicularis - Better position of the eyebrow

- Exophthalmos with eyelid retraction
- Treatment by orbital decompression
- Levator lengthening – Botox injection



Exophthalmos with retraction



After decompression



After levator length



*Botox injection in the corrugator and orbicularis
to decrease the action of the depressor
Final result*

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

2.1.5. UPPER EYELID BLEPHAROPLASTY AND PTOSIS

In cases of minor ptosis with good levator function, use levator reinsertion by the anterior approach with blepharoplasty or Müllerectomy by posterior approach with anterior blepharoplasty.



Levator aponeurosis



Müllerectomy

See the technique in: Ptosis Surgery in Eyelid Malpositions (1.3.).

Patient consulting for blepharoplasty.

She had double involutional ptosis with deep sulcus – hyperrelevation of the eyebrows.



Ptosis – deep sulcus – eyebrow elevation



Result after Müllerectomy



Downgaze



*After Müllerectomy
Without skin blepharoplasty*

2.1.6. LOWER EYELID BLEPHAROPLASTY

Lower eyelid treatment consists of excising excess skin and fat but there are many different clinical situations with bags, hollows, scleral show, malar bags, etc.



Bags



Malar bags



Bags Hollow



Scleral show



Hollow



Bags – lateral canthal dystopia

Lower eyelid examination

- Excess muscle and skin
- Wrinkles
- Fat bags
- Lid free edge laxity
- Ectropion/Entropion - Scleral show/round eye
- Dark circles
- Hollowness behind bags
- "Pseudo-malar bags"
- Lateral canthus crow's feet - medial canthus position



Skin excess – laxity



Snap test to control the laxity



Bags with hollows



Hollows (tear through) without bags

Operative indications

- Excess skin: skin removal
- Excess skin and muscle: skin-muscle removal
- Bags: lipectomy by conjunctival approach
- Bags and excess skin: anterior myocutaneous blepharoplasty with lipectomy
- Round eye – hyperlaxity: lateral canthoplasty
- Scleral show with bags: lipectomy by conjunctival approach
- Scleral show: lengthening of posterior lamella + canthoplasty
- Hollows: filling (hyaluronic acid; fat)
- Hollows with bags: fat transposition
- Mid-facial droop: cheek lift
- Involutional eyelids: [action of the laxity]
- Wrinkles: chemical peeling – laser resurfacing – botox injection (deep wrinkles)

2.1.7. LOWER EYELID LIPECTOMY BY POSTERIOR APPROACH

CLINICAL PEARLS

- Local anaesthesia by conjunctival route
- Eversion of the eyelid on a Desmarres retractor
- Incision of the conjunctival plane at the lower border of the tarsus
- Separation of the conjunctival plane and orbicularis
- Opening of the septal plane
Excision of the central, medial and lateral bags
- Repositioning of the conjunctival plane without sutures



a - Dissection of the central fat bag



b - Coagulation at the base of the bag



c - Excision of the fat after coagulation



d - Take care of the inferior oblique muscle separating the medial and central bag



e - Conjunctival flap



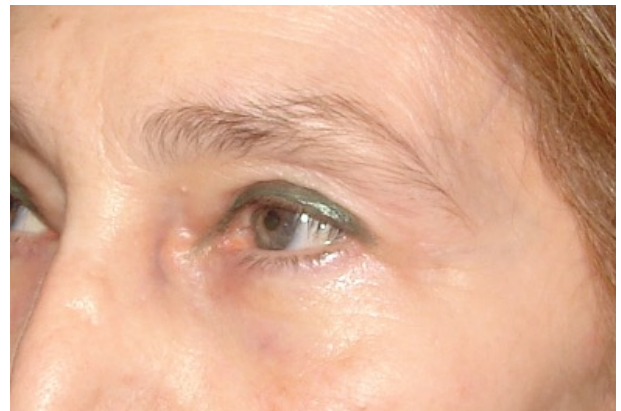
f - Conjunctival incision



Dermatochalasis with major lipoptosis



Result after superior blepharoplasty and lipectomy by conjunctival approach

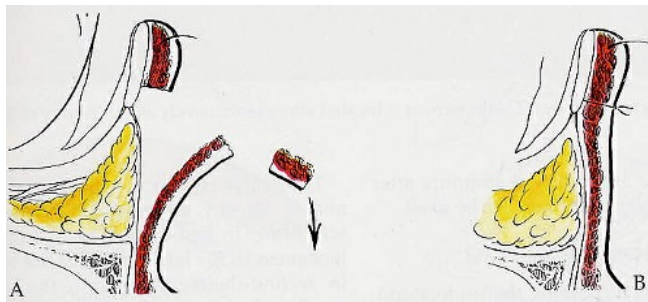


*The same patient 3/4 view before and after surgery: on the upper eyelid the crease is visible
On the lower eyelid no scar and no resection of skin*

2.1.8. LOWER EYELID BLEPHAROPLASTY BY ANTERIOR APPROACH

CLINICAL PEARLS

- Skin-muscle flap
- Fat resection
- Skin-muscle resection
- Anchoring the flap
- Canthoplasty if horizontal laxity



*Skin muscle flap**



Dissection of the flap under the orbicularis



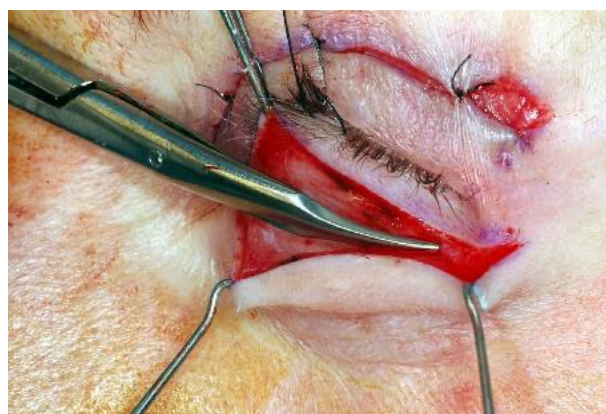
a - Marking the incision 2-3 mm underneath the free edge of the eyelid



b - Local anaesthesia with lidocaine + adrenaline



c - Skin incision

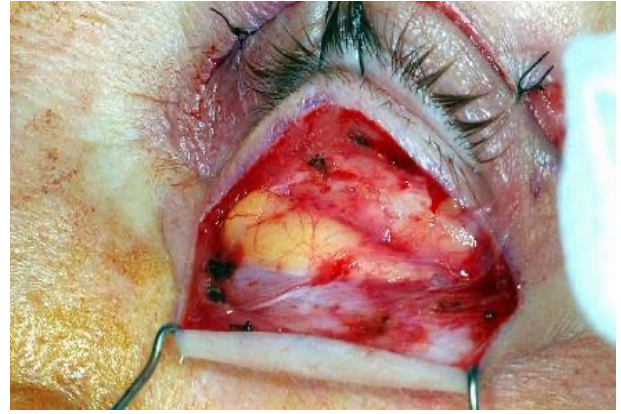


d - Opening and dissection under the orbicularis

* [Ref: personal]



e - Lifting the skin-muscle flap



f - Opening the septum to identify the fat



g - The fat



h - Resection of the medial fat pad



i - Three fat pads after resection



j - Excision of excess skin (2-3 mm)



k - After skin resection – control proper position of the eyelid



l - Running 6/0 silk sutures for 5-7 days

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

Eyelid blepharoplasty by anterior approach

For lower eyelids: skin approach – resection of the three fat bags – skin-muscle flap excision.
At the same time upper eyelid blepharoplasty.



Before



After surgery



Before



After surgery

2.1.9. HOLLOW'S TREATMENT BY FILLERS OR FAT TRANSFERT

Hollow's treatment by fillers

Use injection of hyaluronic acid or fat (lipofilling) in the tear trough.

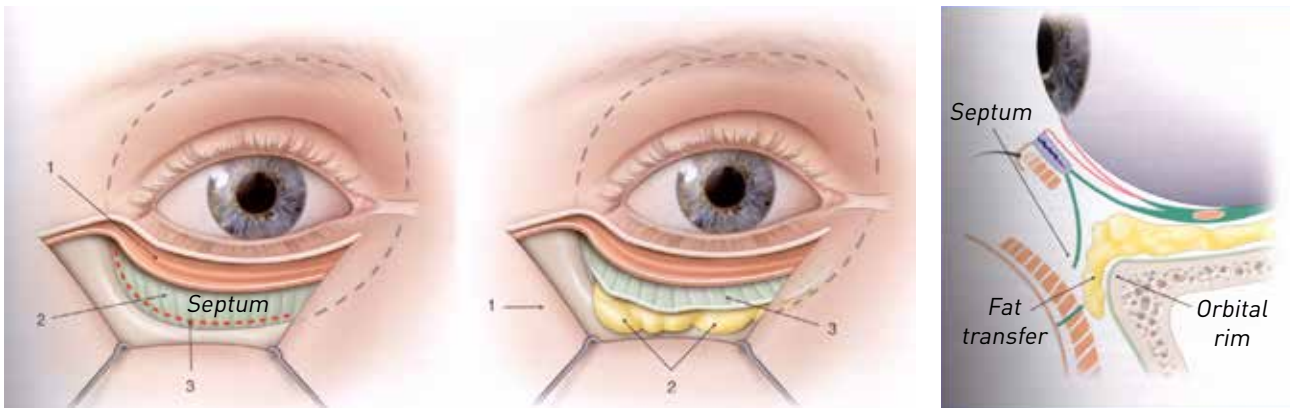


Before and after hyaluronic injection



Before and after fat injection

Hollow's with bags - treatment by fat transfer



*Fat transfer coming from the orbital fat
(53th Congress report of SoFCPRE (Société Française de Chirurgie Plastique Reconstructrice et Esthétique)
Elsevier Masson-2008)*

Original technique (de la Plazza, Goldberg) consists of transposing the excess orbital fat bags into the hollows. The fat is fixed under the orbital rim, between the periosteum and the orbicularis.

Advantages: to treat with the same approach bags and hollows.



a - Drawing of fat transfer

*b - Anterior approach
by skin-muscle flap*

c - Orbital fat exposure

*d - Fat transposition
on the orbital rim*



Result for bags and hollows by fat transfer

2.1.10. CHEEK LIFT: LOWER EYELID TRANSBLEPHAROPLASTY AND MIDFACE REJUVENATION

MIDFACE LIFT

- The midface addresses the ageing changes that occur in the triangular area from the nasolabial fold to the eyelids.

CLINICAL PEARLS

- Transcutaneous pre-septal lower eyelid dissection to the inferior and lateral orbital rim
- Subperiosteal dissection and release of the midfacial soft tissue (or supraperiosteal dissection)
- Preserving middle lamella (do not touch the orbital septum – transconjunctival lipectomy)

- Lower lid canthoplasty in case of laxity
- Vertical elevation and fixation of midfacial soft tissue by orbicularis flap
- Excessive storage of excess orbicularis ocular muscle and lower lid skin
- Two steps are important
 - Anchoring of the canthus which controls the shape of the eyelid fissure
 - Anchoring of the cheek flap which supports the lower lid and cheek



a - Incision



b - Large dissection of a skin muscle flap down to the orbital rim



c - Preparation of a triangular orbicularis flap to anchor the lateral canthus



d - Elevation of the cheek tissues



e - Elevation of the tissues by orbicularis flap



f - Anchor the orbicularis to the superior orbital rim like a suspension

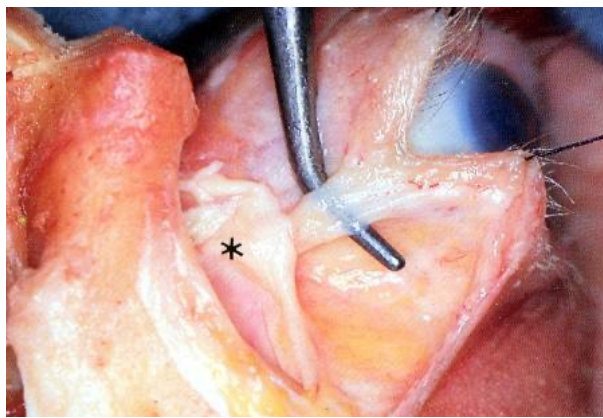
2.2. LATERAL CANTHOPLASTY

Lateral canthoplasty treats the malpositions and malformations of the lateral canthus
Various aspects must be described: inferior dystopias with reduction of the eyelid aperture
Medial dystopia: the lateral angle is displaced towards the nose

Aetiology can be acquired:
Post-traumatic, after blepharoplasty
Degenerative due to relaxation of the lateral canthus
Congenital in orbital and eyelid malformations

Treatment must fix (pexy) the lateral canthus at the correct level (horizontal, vertical and sagittal) with good tension and length of the lower eyelid.

There are many surgical techniques. Our choice is lateral canthoplasty by superior or canthal approach which treats the whole canthus with no modification between lower and upper eyelid
Lateral canthoplasty by orbicularis flap (Botti technique)
Lateral tarsal strip



Anatomy of the lateral canthus/ligament

Some forms



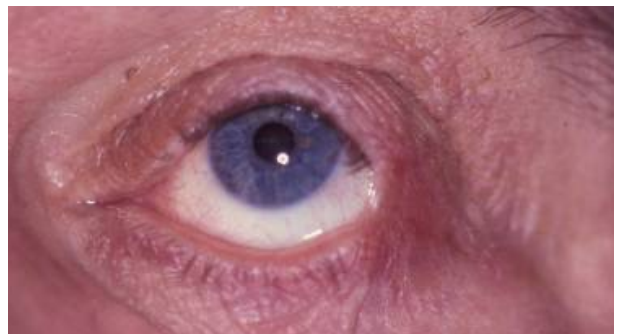
Antimongoloid eyelid aperture



Acquired lateral dystopia



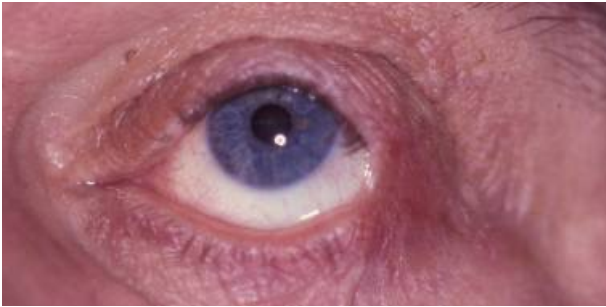
Lateral malposition post-surgery



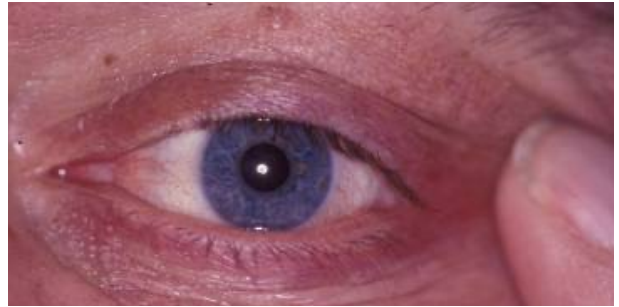
Involutional lateral canthus relaxation

Clinical examination

- Static and dynamic examination
- Lateral canthus position
- Horizontal and vertical laxity
- Mid-face
- Oculopalpebral diastasis
- Orbicularis oculi muscle position
- Tarsal plate
- Eyelash position
- Lower eyelid retraction
- Enophthalmos / exophthalmos



Lateral tendon relaxation



Horizontal laxity: the lateral canthus is repositioned



Involutional ectropion with horizontal and vertical laxity



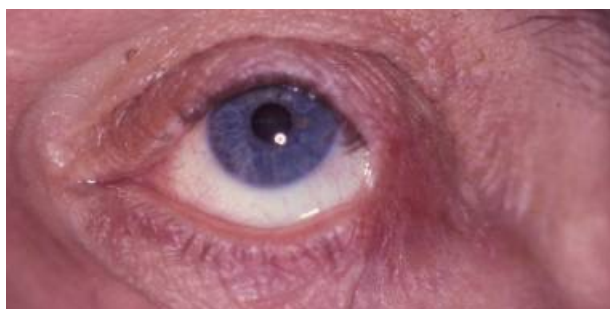
How to control horizontal and vertical laxity

02 BLEPHAROPLASTY & LATERAL CANTHOPLASTY

2.2.1. SURGERY OF THE WHOLE CANTHUS

INDICATIONS

In Case of Lateral Canthus Relaxation



Total relaxation of the lateral canthus



By upper eyelid anterior approach it is easy to dissect the lateral canthus and reposition in the perfect position



a - Drawing of the upper eyelid blepharoplasty



b - After skin resection



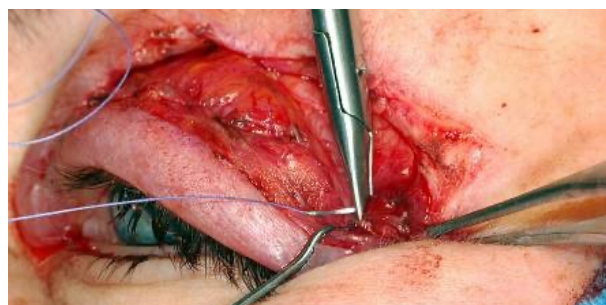
c - Under orbicularis dissection



d - Lateral orbital rim



e - Traction of the lateral canthus



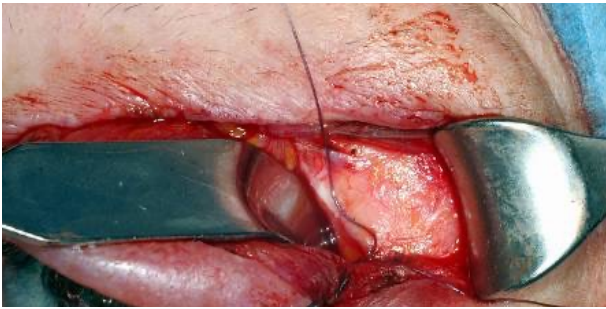
f - Fixation between orbicularis to the periosteum



g - 5/0 Vicryl on the orbicularis



h - Traction towards the orbital rim



i - Suture between orbicularis-orbital rim



j - Lateral canthus in position

Surgery of the whole canthus for a “round eye” after a blepharoplasty



Round eye



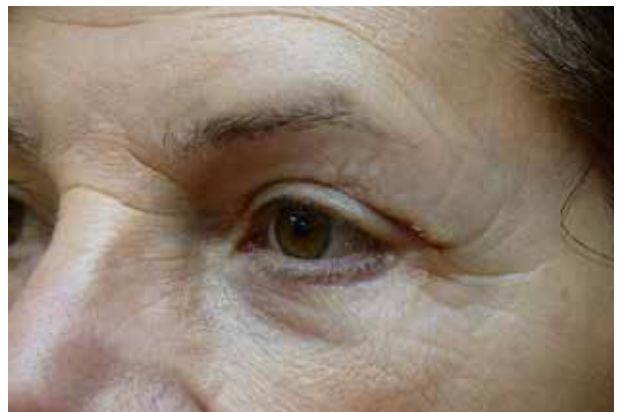
Laxity test



*Result after surgery
by upper eyelid approach*



3/4 view “round eye”



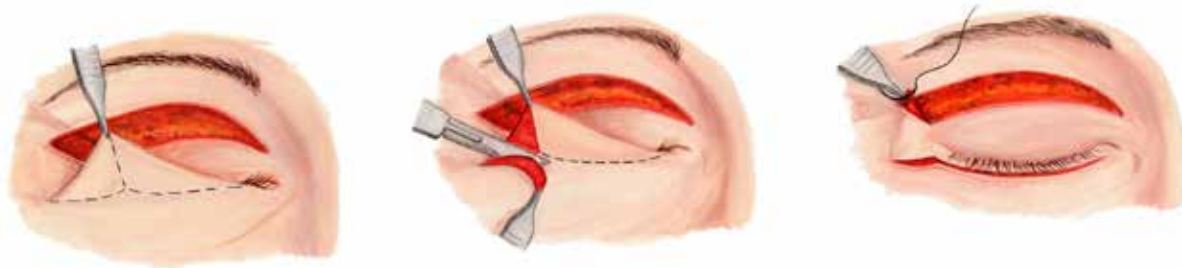
After surgery: lengthening of the lateral canthus

2.2.2.SURGERY OF THE LOWER EYELID

Orbicularis muscle anchoring by means of a muscular flap

INDICATION

For lateral canthal dystopia with excess skin and orbicularis inferior eyelid.



(From G. Botti)



a - Drawing and incisions



b - Suborbicularis dissection



c - Orbicularis flap



d - Traction of the flap



e - Deep dissection under the lateral canthus



f - Orbicularis fixation to the orbital rim 5/0 Vicryl



g - Orbicularis pexy



h - Skin adjustment and resection

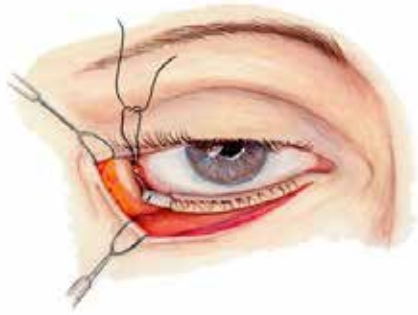
Lateral tarsal strip

This is a well-known technique that consists of fixing the inferior tarsal strip to the periosteum of the lateral canthus.

ADVANTAGES: Good stabilization of the lower eyelid

DISADVANTAGES: Reduction of the aperture

INDICATIONS: Lower eyelid laxity in involutional entropion and ectropion



*Tarsal strip
(From G. Botti)*



a - Canthus incision



b - Excision of the eyelid mucocutaneous junction



c - Suture passed between the inferior tarsal strip and the periosteum of the lateral canthus



d - Deep suture: Vicryl or Prolene 5/0 skin suture Prolene or Silk 6/0

Limits of lateral canthoplasty

- No horizontal or vertical laxity
- Retraction of the anterior and/or posterior lamella
- Exophthalmos
- Fibrosis of the periosteum (subperiosteal dissection)



Severe right exophthalmos: lateral canthoplasty is contraindicated

03

EYELID RECONSTRUCTION

03 EYELID RECONSTRUCTION

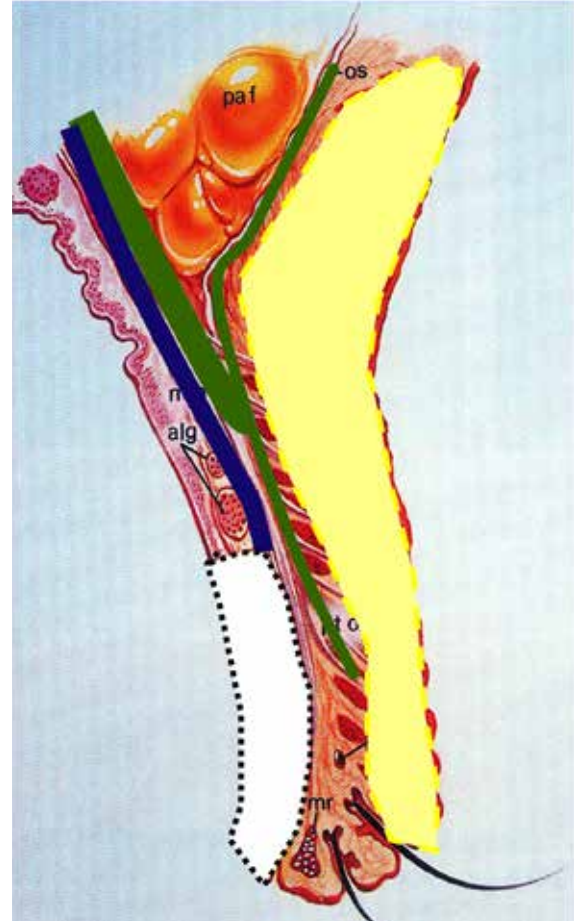
- The repair of any eyelid defect depends on its size and position and the state of the surrounding tissues.
- The approach is similar whatever the cause: traumatic, tumoral or congenital.
- There are different types of defects: anterior lamellar defects, posterior lamellar defects, full-thickness eyelid defects.
- With a partial-thickness defect, try direct closure and if not possible use a graft or flap.
- With a full-thickness defect, first try direct closure, if impossible use lateral cantholysis. If closure is still impossible, choose a combination of flap and graft.

Eyelid reconstruction: principles

- Restore both layers of the eyelids by grafts or flaps:
- Try, when possible, to use local or regional flaps and grafts because the structure of the tissues is similar to the eyelids.
- Have perfect knowledge of eyelid anatomic repair (fornix, lacrimal points, skin crease, grey line, lateral and medial canthus, etc.).
- One of the layers must have a blood supply.
- In full-thickness defects, graft-on-flap or flap-on-graft can be used, but never graft-on-graft.
- Differentiate between partial and full-thickness defects.
- Small defects: up to one quarter or one third of the eyelid can be closed directly.
- Direct closure with associated techniques.

3.1. ANATOMY

- Anterior lamella
 - Skin
 - Orbicular
- Mid lamella
 - Septum
 - Levator
- Müller muscle
- Posterior lamella
 - Tarsus
 - Conjunctiva



Upper eyelid sagittal plan

03 EYELID RECONSTRUCTION

3.2. GRAFTS USED IN OCULOPLASTIC SURGERY

Need for vascularized support. Required for partial-or full-thickness defects

SIMPLE

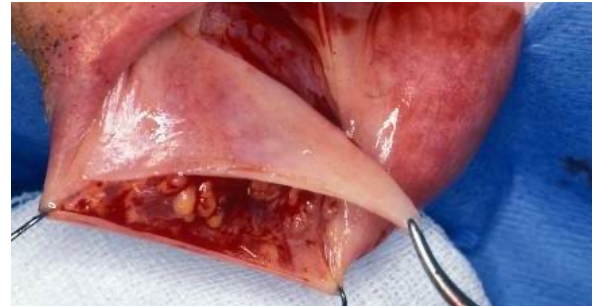
- Skin graft
- Oral mucous membrane graft
- Conjunctiva graft
- Auricular cartilage graft
- Dermo graft

COMPOSITE

- Tarsal plate graft
- Hard plate graft
- Nasal septal cartilage graft
- Tarsomarginal graft



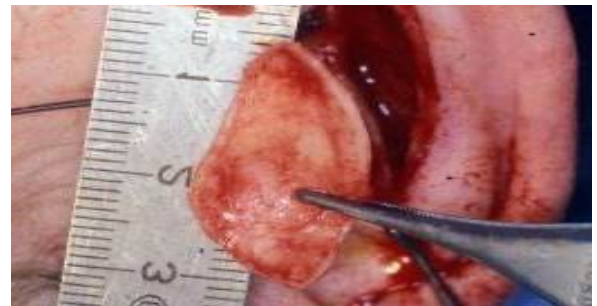
Skin graft



Mucous graft



Dermo graft



Auricular cartilage graft

Sites of removal of free skin grafts



A: Upper eyelid skin graft

B: Retroauricular skin graft

C: Split-thickness graft taken from the arm (EMC)



Upper eyelid graft



Retroauricular graft



Upper eyelid skin graft

- Mark the donor site above skin crease
- Excise the skin as thinly as possible
- Tailor the graft to fit the defect
- Suture the graft and hold it in contact with its bed
- Interrupted 5/0 silk sutures can be used and tied over a bolster for five days



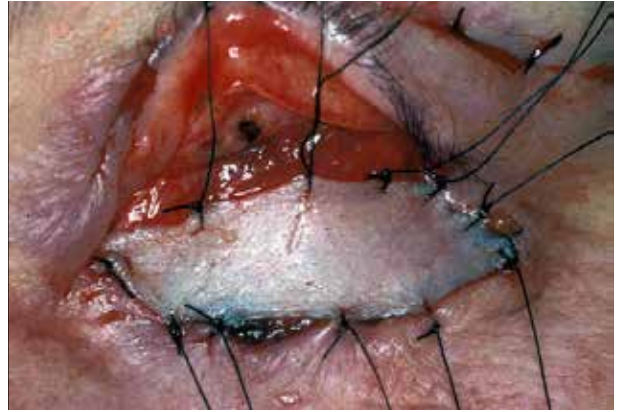
a - Upper eyelid donor site



b - The graft



*c - Upper eyelid anterior lamella defect.
Reconstruction by skin graft*



*d - Graft on a posterior flap for a full-thickness
lower eyelid defect*

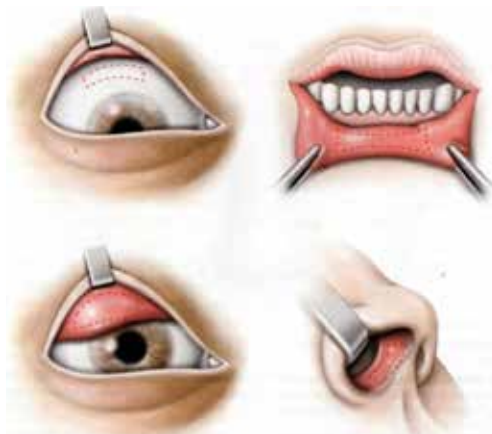


*Cicatricial ectropion by skin defect
Reconstruction by skin graft*

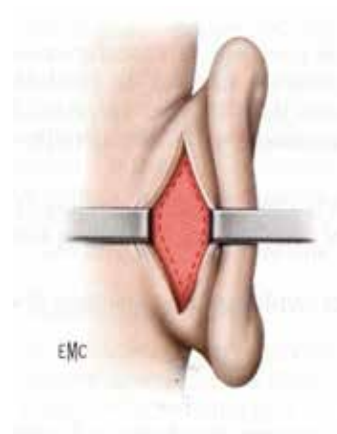


03 EYELID RECONSTRUCTION

Sites of conjunctival mucous, cartilage and composite grafts used for posterior lamellar retraction or defects



(EMC)



Mucopalatine graft



Dermo graft taken from the leg



Tarsoconjunctival graft

Tarsoconjunctival graft to correct mild ptosis and inferior scleral show

The **advantage** of the technique is to simultaneously treat mild ptosis and scleral show by autogenous graft.



a - Left mild ptosis with mild scleral show



*b - Site of tarsoconjunctival graft:
3 mm below the upper border of the tarsus*



c - Incision



d - Tarsoconjunctival flap dissection



e - Tarsoconjunctival graft from the upper eyelid



f - Dissection of the lower eyelid posterior lamella



g - Transposition of the graft suture: Vicryl 6/0



h - Posterior lamella lengthening



Before



*Result after correction at the same time:
ptosis by tarsoconjunctival resection and scleral show
by transposition of the tarsoconjunctival resection
from the upper eyelid*

03 EYELID RECONSTRUCTION

3.3. FLAPS USED IN OCULOPLASTIC SURGERY

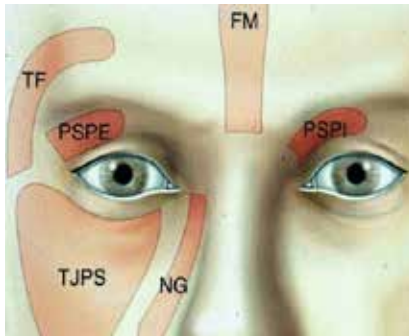
To cover anterior lamellar defects

- Main flaps used in oculoplastic surgery:

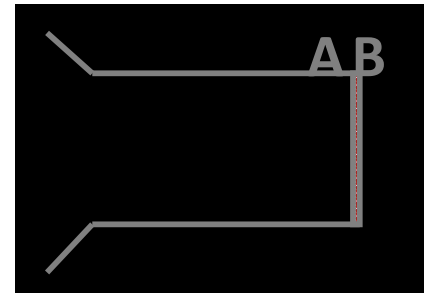
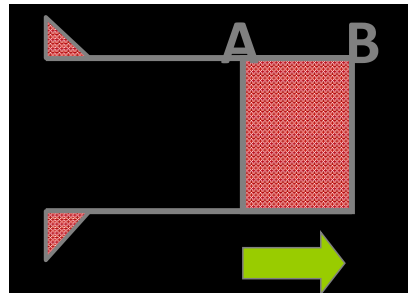
- Advancement flap

- Rotation flap

- Transposed flap



FM: frontal
TF: temporal-frontal
PSPE: superior palpebral
TJPS: temporal-jugal
NG: nasogenian
(EMC)

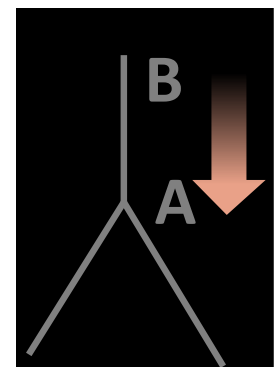
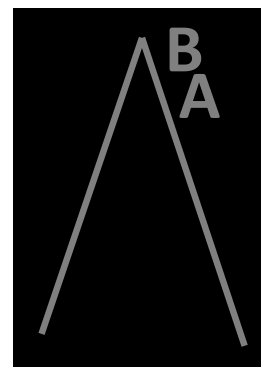


Advancement flaps*

Advancement flap

V-Y Glabellar Flap for Medial Canthus

Carcinoma reconstruction



*



Excision of the tumour



V dissection of the flap



Flap suture the V becomes Y

* [Ref: personal]

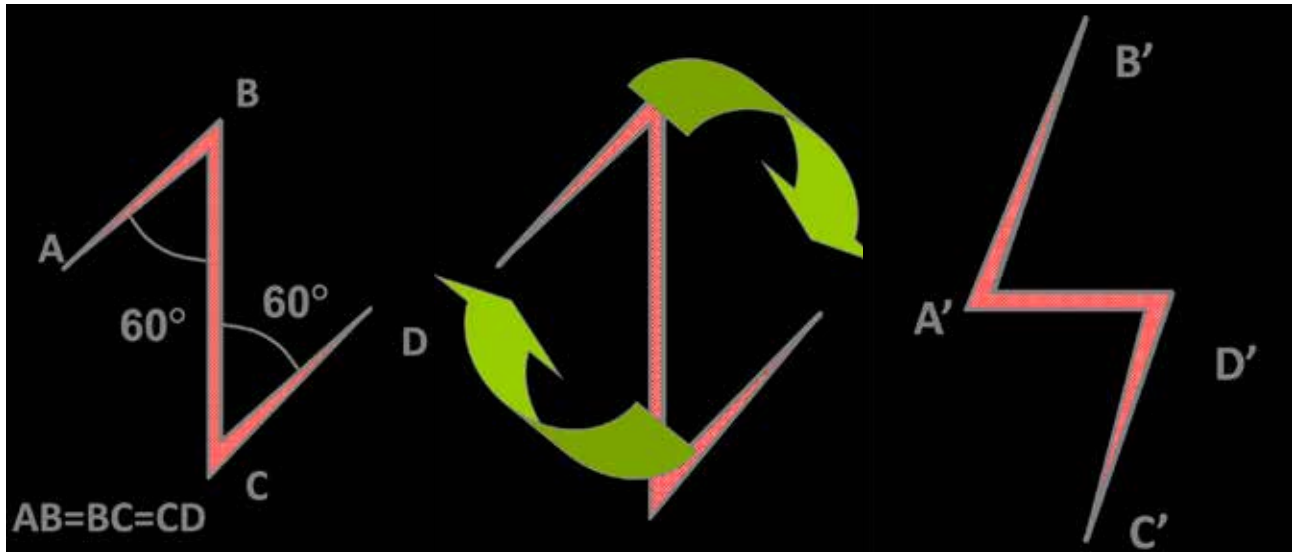


Result

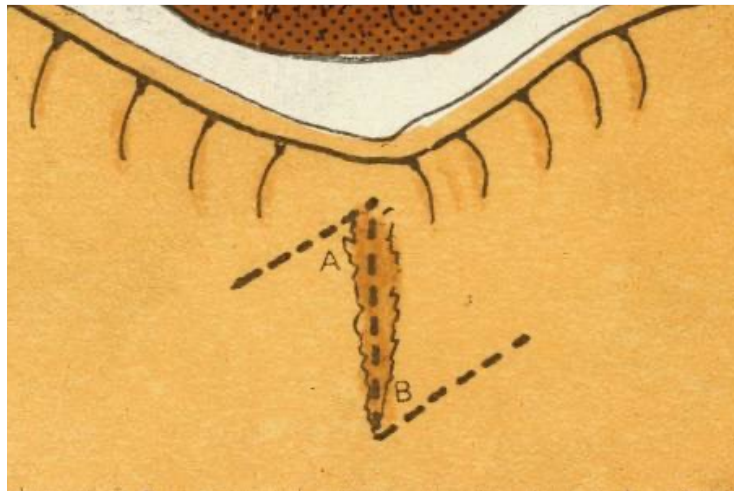
Transposed flaps

- Z-plasty
- Upper to lower lid transposed flap
- Nasojugal flap
- Rhombic flap

The Z-Plasty



Two flaps of skin are transposed to lengthen a localized scar and break its continuity
The line of the B-C scar after transposition of the two triangular flaps becomes B'-C' which is longer*



*



Multiple Z-plasties to correct a severe vertical skin retraction
(see chapter on cicatricial ectropion 1.2.2)

* [Ref: personal]

03 EYELID RECONSTRUCTION

3.4. EYELID INJURY REPAIR WITHOUT LOSS OF TISSUE

Immediate management

- Lacrimal drainage injuries
- Medial canthal tendon injuries
- Traumatic ptosis
- Loss of eyelid tissue
- Reconstruction with the eyelid anatomic repair and avoid resection of tissues

Secondary management

- Corneal exposure, scar revision, loss of tissue, etc.

Eyelid injuries without loss of tissue

Immediate repair



*Appearance: it seems that there is a loss of tissue
Avoid resection of tissue
Find the eyelid anatomic repair and
reconstruct by direct closure in two or three layers*



Final result

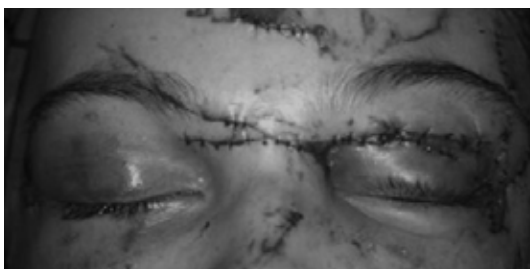
Intraorbital foreign body – eyelid laceration



Glass foreign body: Foreign body extraction



Exploration of the eyelid and the levator



*End of surgery
Sutures with conservation of tissues*



Final result

Complex Trauma

Eyeball bursting – upper eyelid laceration – orbital fracture



It seems that there is no upper eyelid. After exploration multiple tissues were found.



Appearance of the eyelid after emergency reconstruction



Scar three months postop



Final result with a prosthesis

Emergency graft and flap



Severe eyeball trauma with upper eyelid laceration, medial canthus injury, lower eyelid laceration and jugal loss of tissue



Total tissue loss (respect of the facial units) jugal flap drawing



Reconstruction by two full-thickness skin grafts for upper and lower eyelids and jugal advancement flap



Final result at Month 6

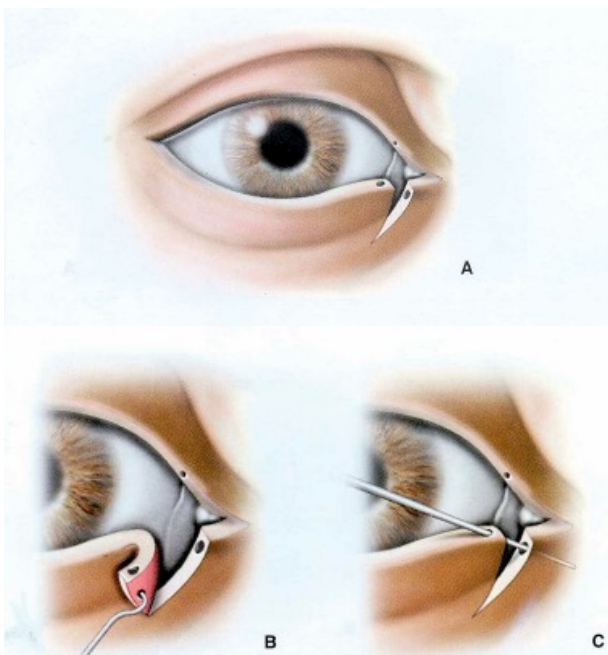
3.5. EYELID AVULSIONS

- They occur after hooking of the eyelid, regardless of the cause.
- Rupture occurs at the weak point of the eyelids:
 - either at the portion of the lacrimal part of the free edge, with the internal canthal tendon remaining in place.
 - or at the level of the tarsal skeleton especially for the upper eyelid with involvement of the levator muscle.
- At the level of the lower eyelid, the inferior canaliculus is sectioned. Its repair includes either suturing under operative microscope of both the distal and proximal ends with 10/0 monofilament and placement of a catheter, or mono- or bicanalicular nasal intubation.
- At the level of the upper eyelid, the integrity of the levator muscle needs to be controlled.

Lower eyelid avulsion



*Control the canaliculus and repair it by intubation
Then fix the lower eyelid by blepharopexy*

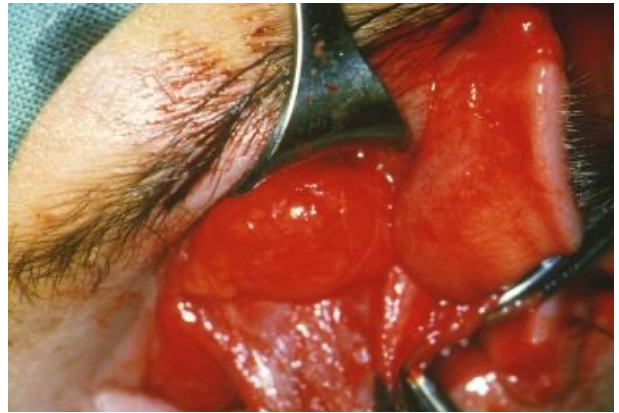


CANALICULUS INJURY - Canaliculus intubation (EMC)

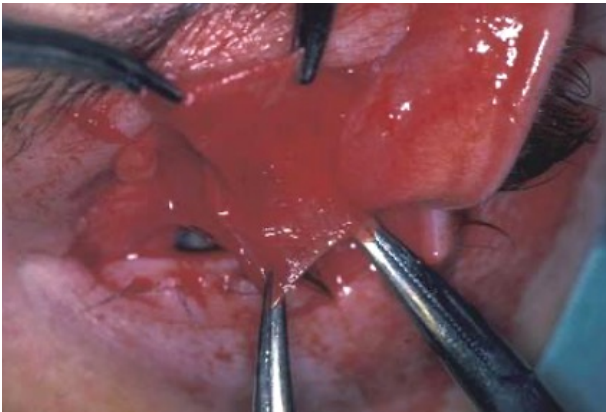
Upper eyelid avulsion Levator exploration



a - Upper eyelid tearing at the medial canthus and the upper border of the tarsus



b - Fix the eyelid to the medial canthus. Then explore the levator. See the preaponeurotic fat pad above the levator.



c - Levator exploration



d - Suture the levator to the tarsus

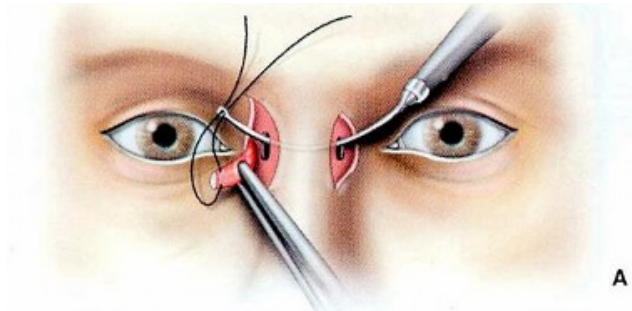


e - Result

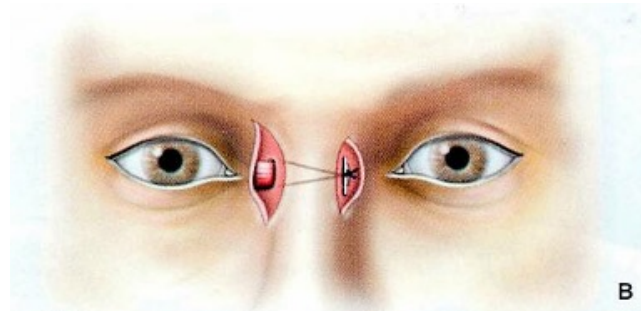
03 EYELID RECONSTRUCTION

Transnasal wire

Canthopexy for traumatic canthal dystopia



*Traumatic canthal dystopia is a rare situation with orbital fracture. There is canthal dystopia which is too low, laterally displaced and advanced.
(EMC)*



*A wire is passed through the nose and attached to the medial canthal tissues on both sides. When it is tightened, the intercanthal distance is reduced.
(EMC)*

Transnasal canthopexy

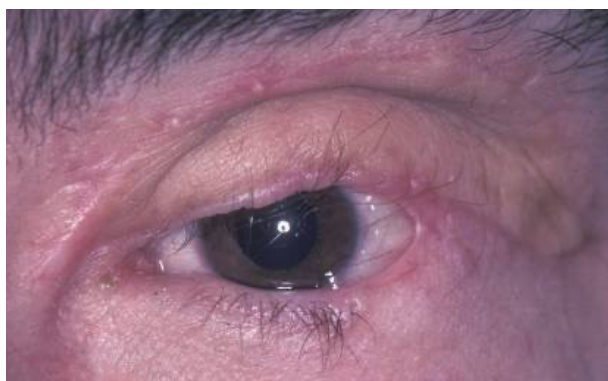
For traumatic canthal dystopia with loss of tissue



*Canthal dystopia (loss of relief)
The eyelids are closed to protect the eyeball.*



*Medial canthopexy. The canthus is well positioned
But discovery of significant,
full-thickness eyelid tissue loss.*



Final result after reconstruction of both eyelids.

3.6. PARTIAL THICKNESS DEFECTS

- Direct closure if defect is less than one quarter or one third of the eyelid
- Direct closure with extra tissue laterally
- Closure with skin graft for anterior lamella defect
- Closure with a flap or graft for posterior lamella defect (deep defect).

3.6.1. ANTERIOR LAMELLAR DEFECTS (TREATED BY A FULL-THICKNESS SKIN GRAFT)



a - Upper eyelid retraction



*b - Lid lag and malocclusion
Anterior lamella retraction*



c - Full-thickness skin graft



d - Skin graft – Day 7 postop



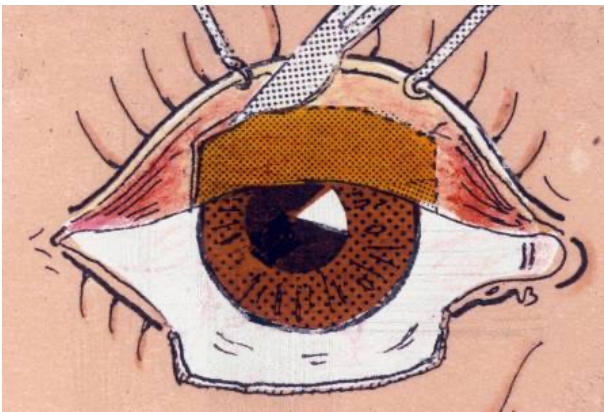
*e - Result in downgaze
Month 3 postop*



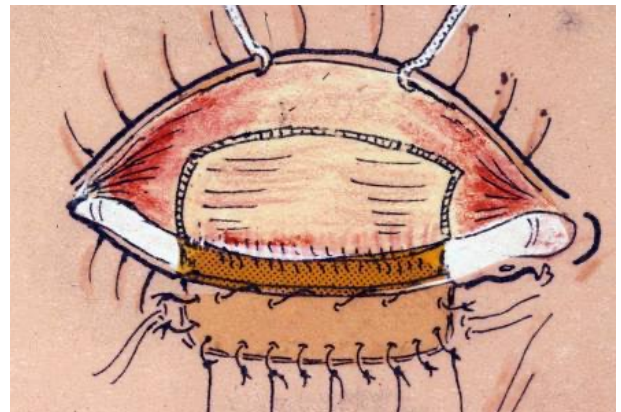
f - Primary position

3.6.2. FLAPS TO RECONSTRUCT POSTERIOR LAMELLA

- Conjunctival flap
- Lateral periosteal flap
- Tarsconjunctival flap from the upper eyelid to the lower eyelid (Köllner)



*Defect of the lower eyelid-tarsconjunctival flap from the upper eyelid**



*Posterior flap covered by a graft**

* [Ref: personal]

03 EYELID RECONSTRUCTION

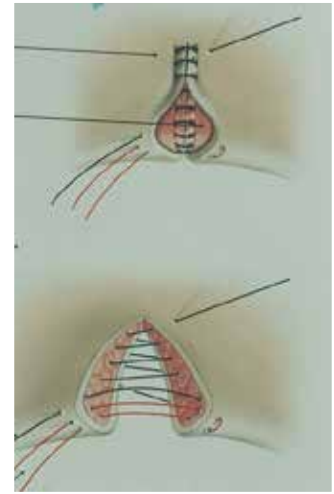
3.7. FULL-THICKNESS DEFECTS

Small full-thickness eyelid defects < 1/4–1/3 length

- Three suture layers
- One suture on the margin 6/0 silk
- Tarsoconjunctival running suture 6/0 Vicryl or Prolene
- Orbicularis suture
- Skin suture 6/0

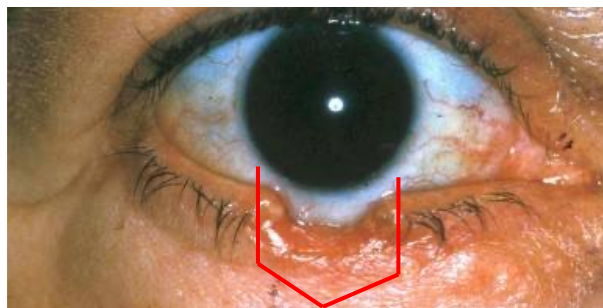


Direct closure

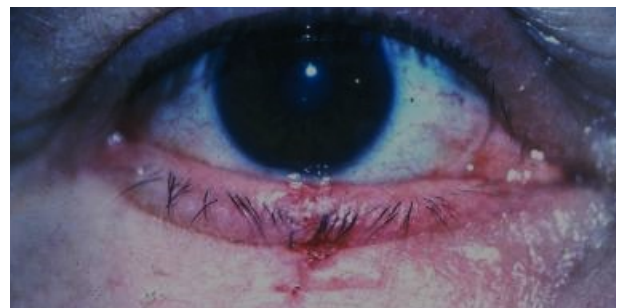


(EMC)

Traumatic full-thickness defect < 1/4–1/3



Totality of the defect shown by pentagonal drawing



Direct closure in three layers

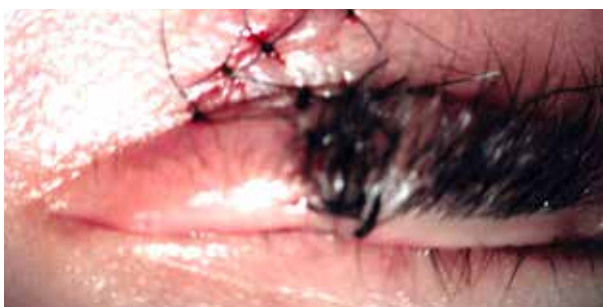
Congenital full-thickness defect < 1/4–1/3



Congenital coloboma - Pentagonal resection



After resection



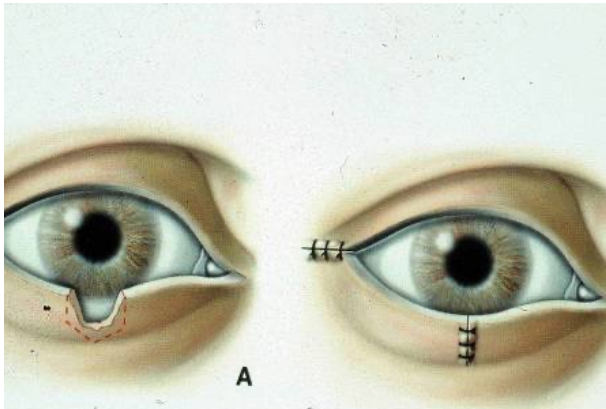
Three suture layers with Z-plasty



Final result

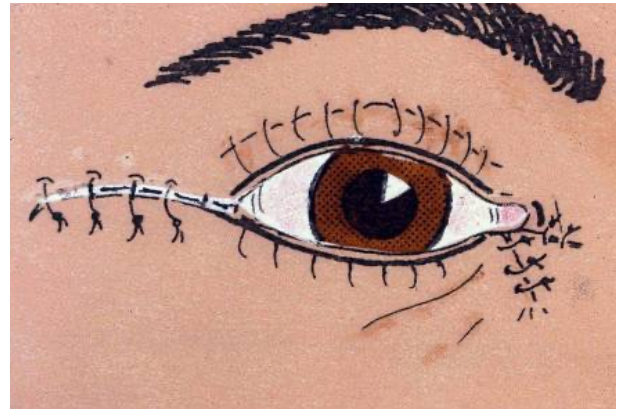
Full-thickness eyelid defects < 1/3 length

Close directly, or perform lateral cantholysis if there is too much tension



A

(EMC)



*



Double full-thickness eyelid defect
Reconstruction by two advancement flaps with cantholysis



Congenital coloboma < 1/3 length



Result after advancement flap and cantholysis



Large upper eyelid coloboma

* (Ref: personal)



Result after advancement flap

03 EYELID RECONSTRUCTION

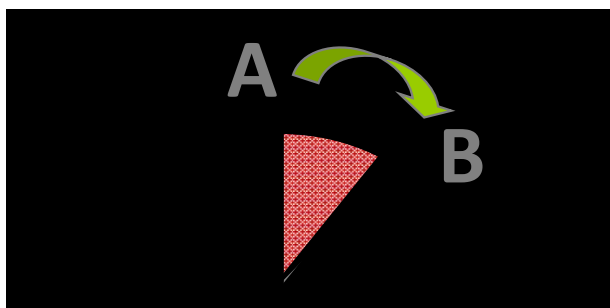
Lower eyelid reconstruction Full-thickness defect >1/4–1/3

There are a lot of possible combinations

VERTICAL DEFECTS

- Lateral, central defects: temporal-jugal rotation and posterior lamellar graft
- Total defects: orbital-nasogenian flap (from Tessier) and posterior lamellar graft

Cheek rotation flap for vertical defects



*Rotation flap**

MARGINAL DEFECTS

- Upper eyelid skin flap with tarsoconjunctival graft
- Tarsoconjunctival upper eyelid flap with skin graft



Large, full-thickness lower defect



Dissection of a large rotation - Jugal flap which cover a posterior lamellar graft



Temporal-jugal Rotation Flap After Injury of the Lower Eyelid



Posterior lamella reconstructed by tarsoconjunctival graft



The jugal flap is fixed to the medial canthus – the margin is rebuilt by running suture between posterior graft and anterior flap



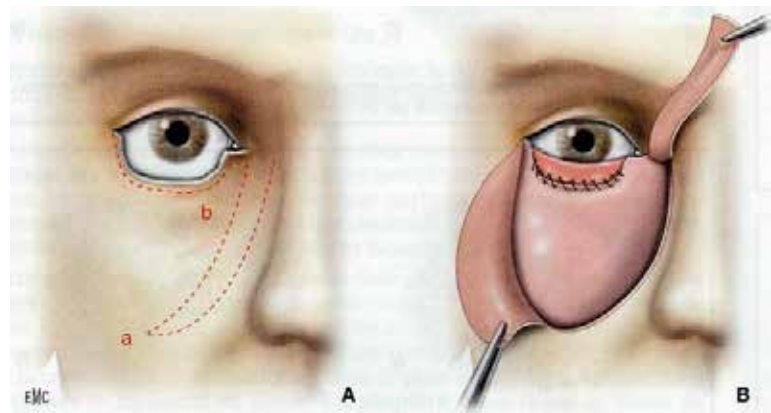
Suture



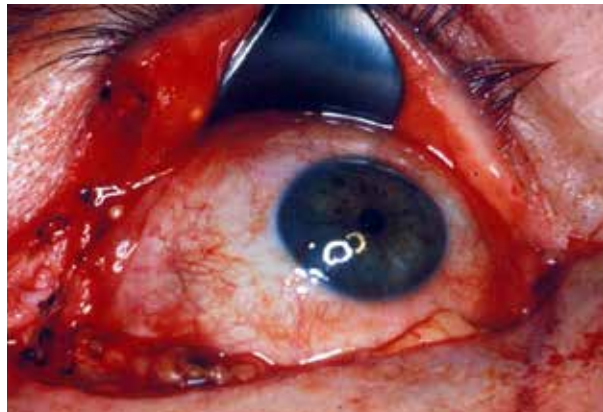
Result

* [Ref: personal]

Orbital-nasogenian flap with mucosal graft For lower eyelid full-thickness defect



(EMC)



Complete defect of the lower eyelid



*Mucosal graft
For the posterior lamella
Preparation of the anterior flap*



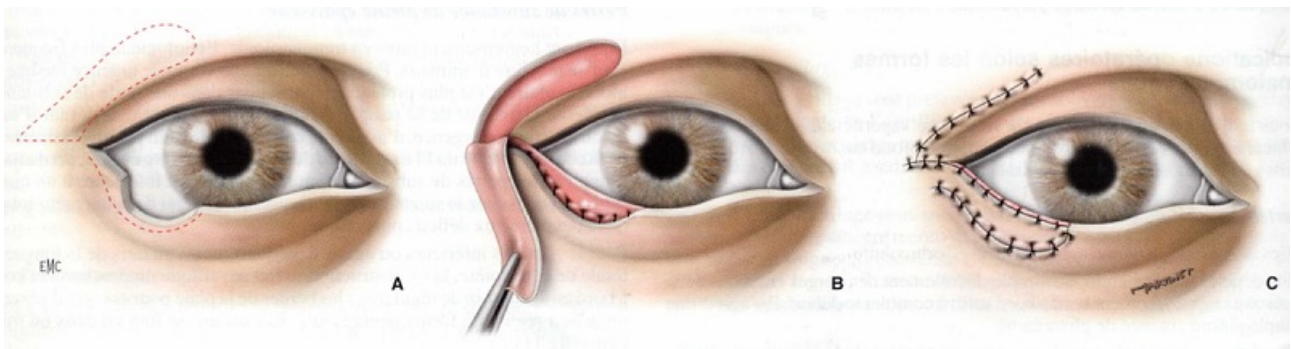
*Transposition of the flap
The defect is rebuilt by direct closure with the jugal skin.*

03 EYELID RECONSTRUCTION

**Upper eyelid skin flap – composite graft
For lower full-thickness marginal defect**



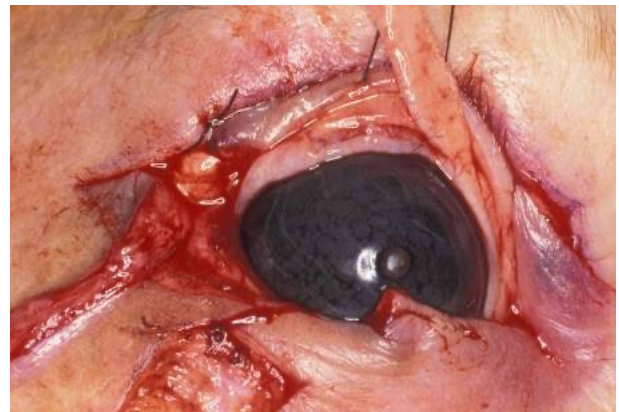
Total marginal defect



Anterior skin flap with posterior graft (EMC)



a - Taking tarsoconjunctival graft from the upper eyelid



*b - Upper eyelid graft
Lower defect*

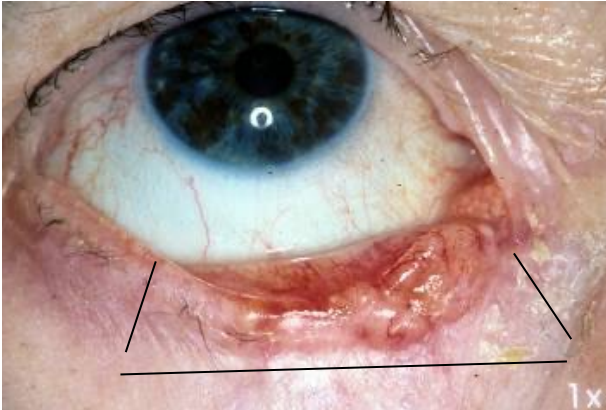


c - Graft in the defect before fixing



d - The upper eyelid skin flap covers the graft

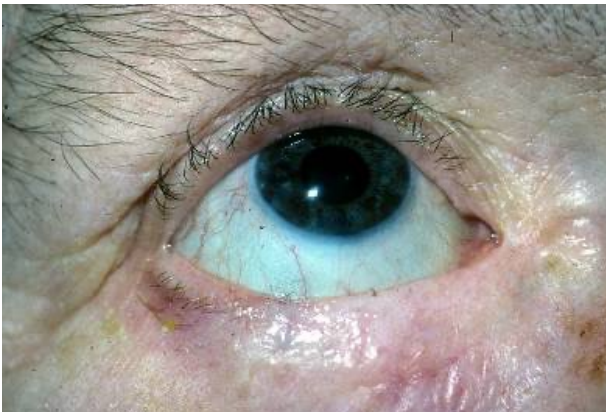
**Upper eyelid skin flap – composite graft
For lower full-thickness marginal defect**



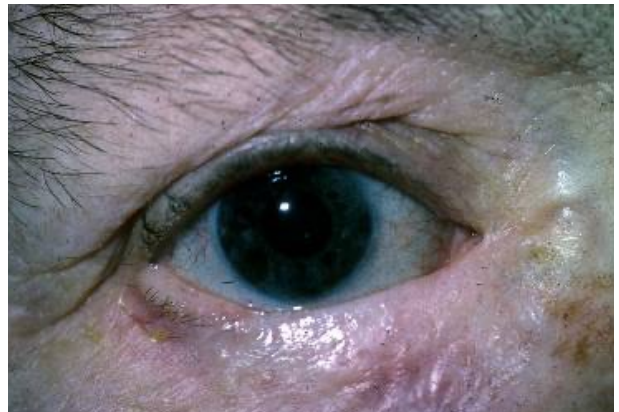
Large carcinoma



Resection



Result

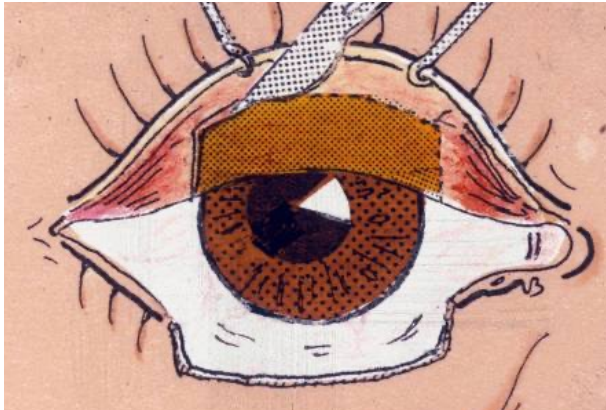


03 EYELID RECONSTRUCTION

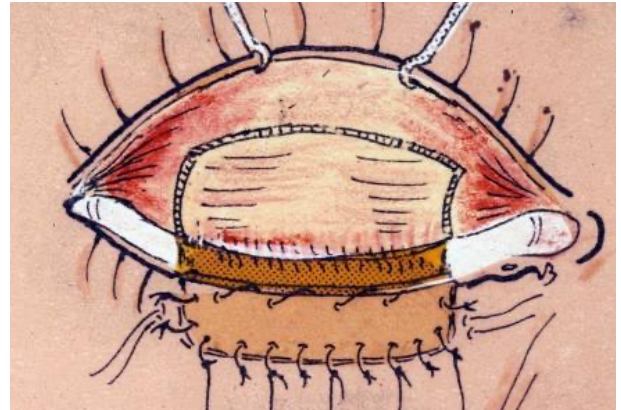
Tarsoconjunctival flap with skin graft (Köllner) For lower full-thickness marginal defect

BENEFIT: very good vascularization.

INCONVENIENCE: the eye remains closed for three weeks, and a second surgery is required for pedicle sectioning and regulation of the eyelid margin



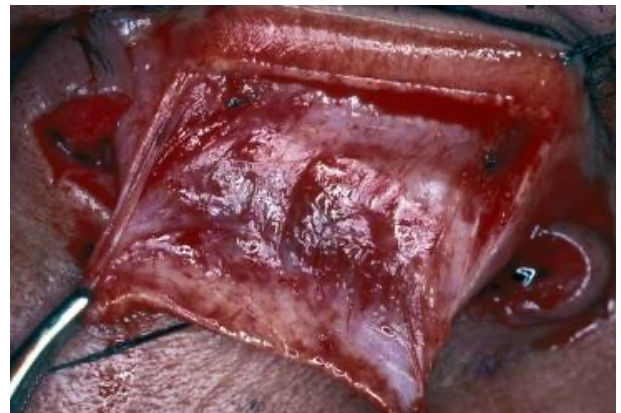
*A Full-thickness lower eyelid loss of tissue**



*Posterior lamella is reconstructed by flap**



a - Sebaceous carcinoma



b - Flap

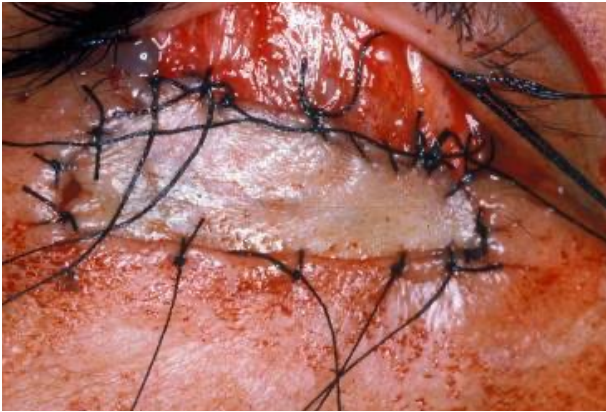


c - Suture of the flap to the defect



d - Skin graft on the flap to reconstruct the anterior lamella

** [Ref: personal]*



e - Skin graft on the flap to reconstruct the anterior lamella



f - First stage: tumour resection and reconstruction (patch on the skin graft)



g - Before pedicle sectioning



h - Final result

Upper eyelid reconstruction Full-thickness defect $>1/4-1/3$

WHAT TO USE? MANY POSSIBLE COMBINATIONS

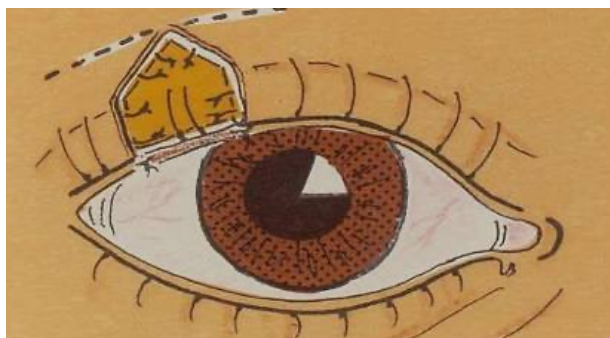
- Tarsomarginal graft (Hubner)
- Cutler-Beard flap
- Switch flap (Abbé-Mustardé)
- Temporal flap (Tenzel)
- Other



Congenital upper eyelid coloboma

03 EYELID RECONSTRUCTION

Tarsomarginal graft (Hubner)



*Donor site no more than 1/4 length**



Excise the skin



Excise the graft and close the defect by direct closure



Graft without skin



*



Full-thickness margin eyelid loss of tissue



Lagophthalmos



Before



After reconstruction

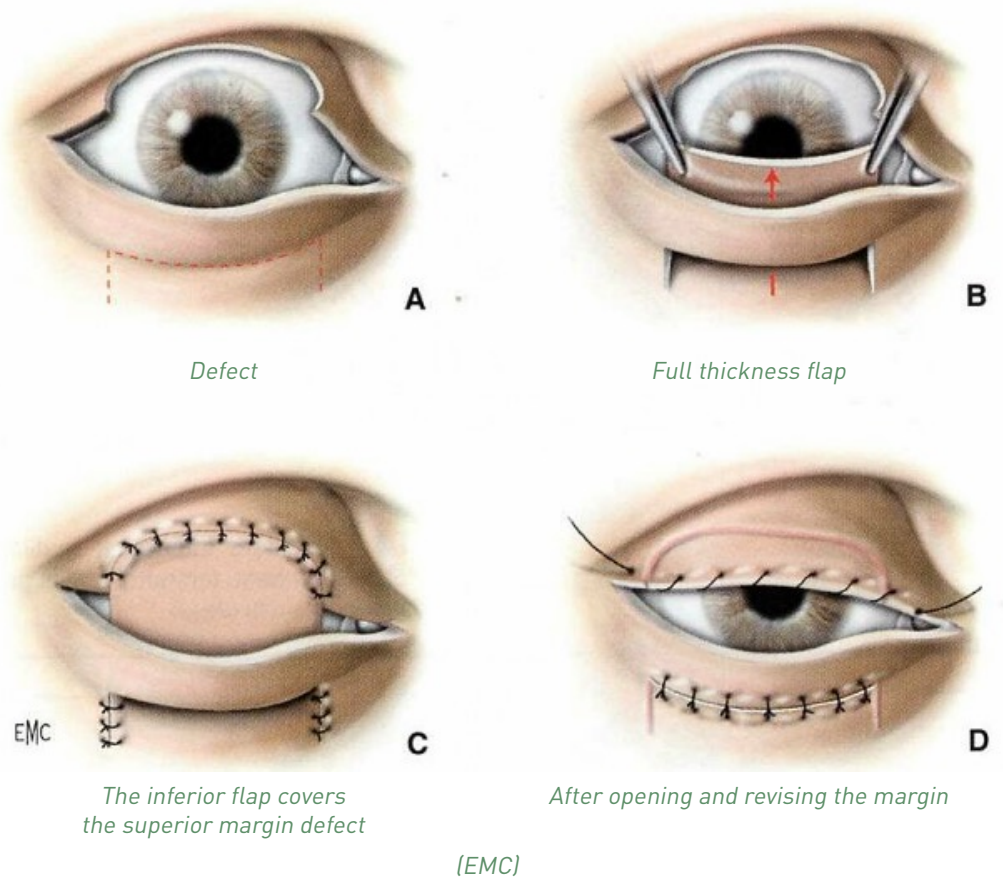
* [Ref: personal]

Cutler beard flap for marginal full-thickness upper eyelid loss of tissue

A full-thickness flap of lower eyelid tissue is mobilized 5 mm below the lid margin (to avoid necrosis of the lower eyelid bridge) and sutured into the upper eyelid margin defect.

BENEFIT: very good vascularization.

INCONVENIENCE: the eye must remain closed for three weeks, and a second surgery is required to open and reconstruct the lower lid (the lid margin)



03 EYELID RECONSTRUCTION



*a - Upper eyelid defect
Dissection of the flap 5 mm below the lid margin*



b - Lower lid bridge



c - The flap covers the defect



d - Three weeks later before pedicle sectioning



e - Before pedicle sectioning



f - After pedicle sectioning and margin reconstruction



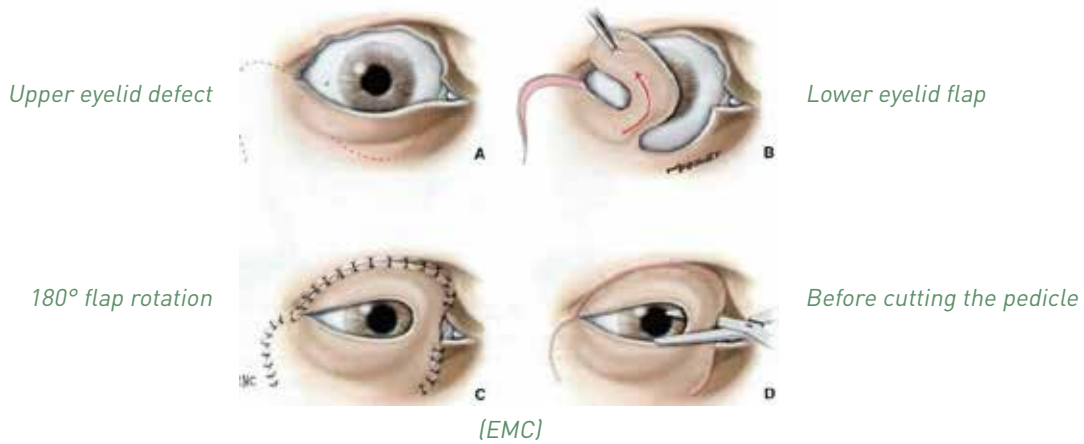
g - Final result



Switch flap (Abbé-Mustardé) full-thickness lower eyelid flap to rebuild Full-thickness upper eyelid defect

Very original technique that uses the lower eyelid to reconstruct a full-thickness upper eyelid deficit. The flap is rotated 180°. The width of the pedicle of the flap must be 4 mm to ensure vascularization. It will be sectioned between 8 and 21 days depending

on the importance of eyelid transposition. Lower lid reconstruction at the transposition area is done by edge-to-edge attachment or by temporal-jugal or orbital-nasogenian flap.



Large congenital upper eyelid coloboma



Drawing of the flap*



a - Excision of tissue and preparation of the flap



b - Full-thickness lower eyelid flap with a large, 4-mm pedicle



c - The flap in the defect



d - Lower eyelid is directly closed
The pedicle will be cut after 15 days.



e - Seven years later: vision has been preserved.

* [Ref: personnal]

3.8. EYELID RECONSTRUCTION IN FACIAL PLASTY

SEVENTH NERVE PALSY

The main problems are:

- corneal exposure which can be treated by reducing the eyelid aperture, by improving lid closure (upper lid weight)
- paralytic ectropion is treated by medial or lateral canthoplasty, by skin graft
- poor cosmetic is treated by brow lift, by botulinum toxin, etc.

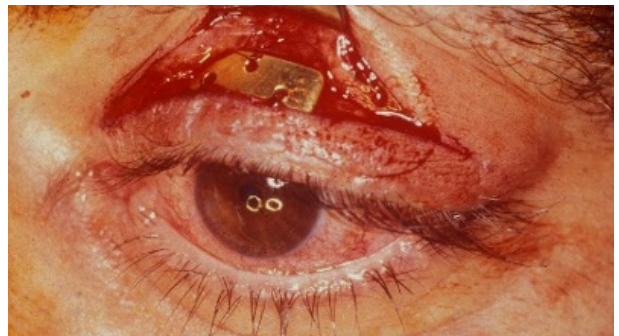
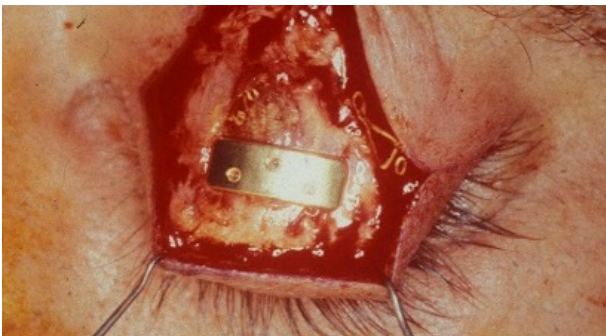


Lagophthalmos



After gold plate in the upper eyelid

Gold plate in the upper eyelid to increase the occlusion



Before surgery



*After gold plate in the upper eyelid
The occlusion is much better*



Facial palsy – ectropion



Treatment: eyebrow lift – lateral and medial canthoplasty

Facial palsy – ectropion



Treatment by skin graft – eyebrow lift

Section 2

ORBIT

GENERAL CONSIDERATIONS IN PATHOLOGY AND ORBITAL SURGERY

A few years ago, the orbit was considered an anatomic region at the crossroads of multiple specialities which could be involved in diseases.

Today, orbital pathology has become a speciality in and of itself within ophthalmology, managed by reference centers that contribute to its development. Good collaboration with maxillofacial, ENT, plastic, neuroradiology and surgical specialities is still necessary and often indispensable. Orbital pathology centres have also worked more closely with oncology centres for the management of orbital tumours.

Four main chapters on the study of the orbit are illustrated, emphasising the surgical aspects of various aspects of orbital pathology: Orbital Surgical Approach; Orbital Trauma and Orbital Fractures; Orbital Socket and Conjunctival Bag Surgery; Surgical Approach of Dysthyroid Orbitopathy.

In “Orbital Surgical Approach”: Thanks to better anatomical knowledge, very specific image-guided localization of lesions, the approach is anterior through small incisions. A neurosurgical approach is used for highly posterior lesions. An endoscopic approach may also be useful.

In “Orbital Trauma-Orbital Fractures”: Bone deformities are clearly visible on CTS and 3D imaging. MRI shows the entire orbital cavity and its contents. It allows for an assessment of the injuries to the eyeball, muscles, and soft tissues. The pathophysiology of mechanical, neurogenic, and myogenic disorders can be clarified, followed by treatment indications and prognosis.

In “Orbital Socket and Conjunctival Bag Surgery”: The improvement in cavity surgery is remarkable, with the use of new biomaterials for intraorbital implants; magnetic implants on titanium screws allowing for the insertion of moulded epitheses for exenteration cavities; complex orbital and eyelid reconstructions for congenital anophthalmia and microphthalmia.

In “Surgical Approach of Dysthyroid Orbitopathy”: Investigative methods have allowed for better classification and appropriate medical and/or surgical treatments.

In the medical inflammatory stage, treatments involve corticosteroid therapy with or without a bolus of methylprednisolone and/or orbital radiotherapy.

Optic neuropathy is easily diagnosed by the automated visual field, colour vision and OCT. Recognising it justifies the use of medical and/or surgical treatments with good functional outcomes. Highly posterior orbital decompression when faced with optic neuropathy is considered a delayed emergency in case of failure of medical treatment.

01

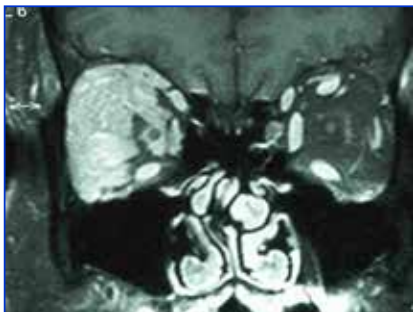
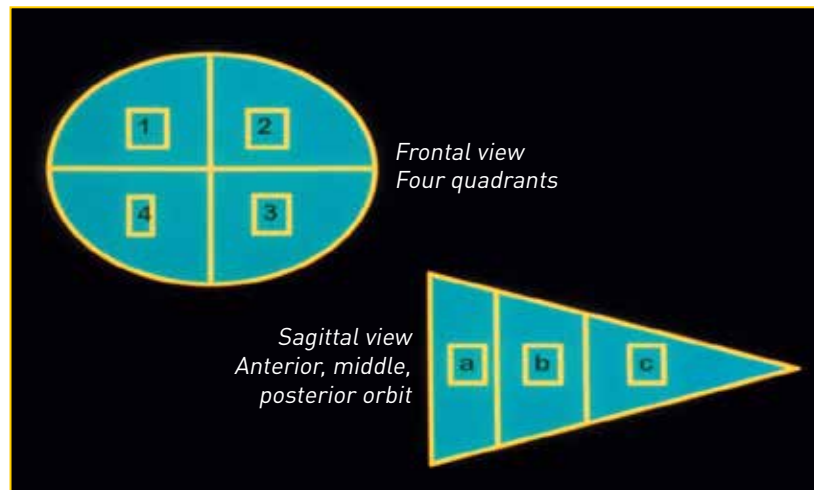
ORBITAL SURGICAL APPROACH

Orbital surgical approach

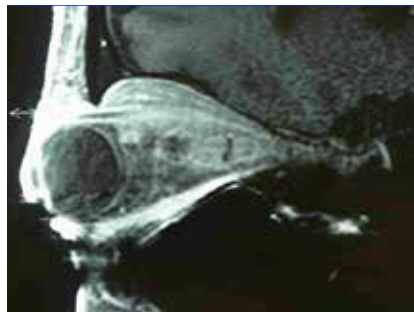
- Orbital surgery is based on a good understanding of orbital pathology, its progress and the anatomical changes it causes.
- Irrespective of the type of pathology, the approaches are identical regardless of orbital inflammation, dysthyroid orbitopathy, neoplasia, structural abnormalities, vascular malformations, etc.
- Surgery is confronted with the quality of the approach and how small it is, its masking in a natural fold of the face and the concern of removing a pathological process that is sometimes large, poorly located, adhering to healthy tissues.
- In most cases, lesions can be removed by anterior approach (anterior and middle orbit) and are the responsibility of the orbit specialist.
- In a few rare cases, the orbit specialist will have the support of a neurosurgeon, maxillofacial and ENT specialist especially for lesions near the orbital apex, in orbital and periorbital tumours, in some more complex varieties involving cranioorbital-facial complex.
- The choice of approach depends on several parameters, the type of pathology, the extent of the lesions, their location, their extent, the treatment objectives: pure exploration, excisional biopsy, tumour excision with or without reconstruction.
- The site of the lesions can be separated into four territories in a frontal plane: upper lesions approached by upper orbitotomy; lateral lesions that respond to lateral orbitotomy; lower lesions treated by inferior approach, median lesions.
- In a sagittal plane, the orbit can be separated into three parts: anterior and middle orbit approachable by an anterior route; posterior orbit or apical lesions according to their location above the optic nerve are approached neurosurgically with roof deposit; conversely, inferior lesions below the optic nerve are more easily explored by inferotemporal osteotomy or inferior marginotomy.
- These approaches can be combined with other surgical procedures such as orbitotomy of the roof, lateral wall, infraorbital rim in order to better expose the orbit.



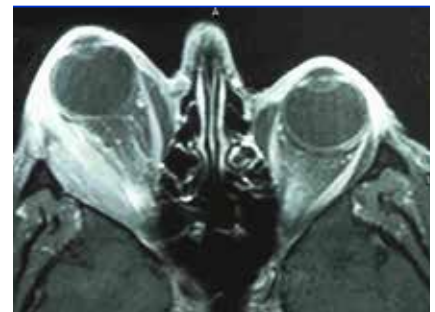
Proptosis With Orbital Tumour



Coronal view



Sagittal view



Axial view

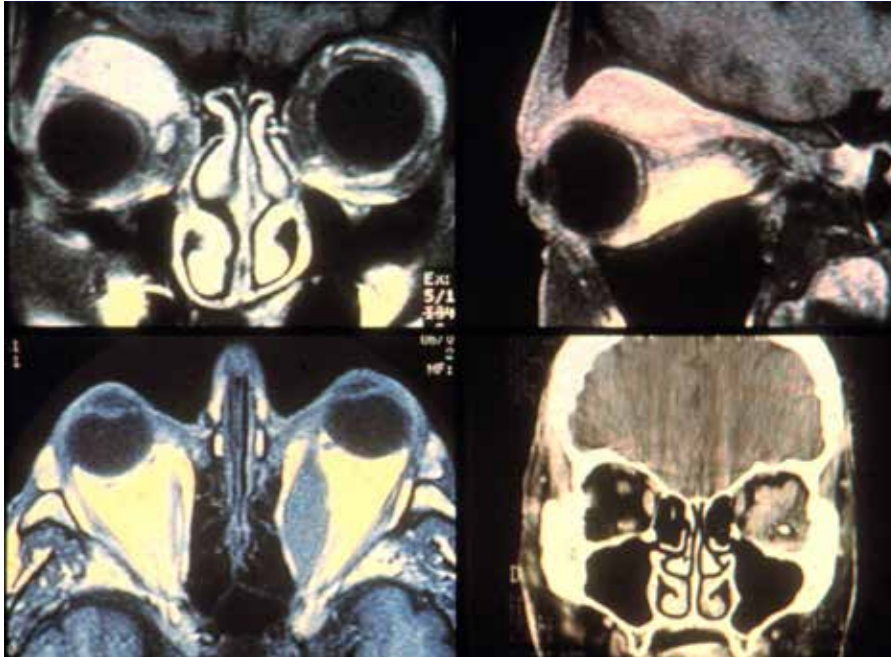
MRI Exploration in the Three Planes

1.1. INDICATIONS AND OPERATIVE PRINCIPLES

The choice of surgical approach depends on:

- Topography (size, depth, relationship with orbital structures)
- Aetiology
- Surgical indications

TOPOGRAPHY



AETIOLOGY



Congenital



Traumatic



Tumoural



Inflammation

Surgical indications



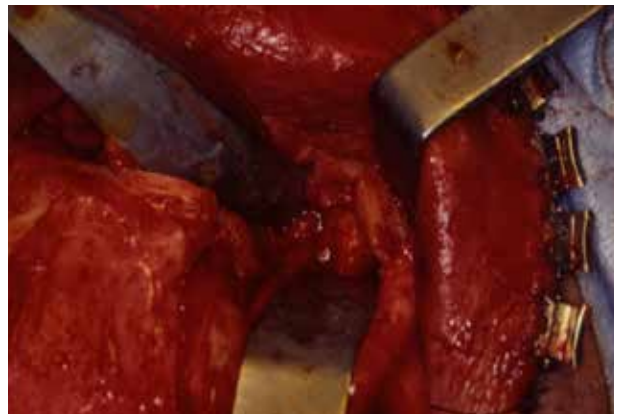
Tumour removal



Tumour removal + reconstruction



Reconstruction of bony walls



Decompression

Operative principles

- Adequate instrumentation
 - Optimal exposure and visualization
 - Bloodless field
 - Preservation of non-involved structures
 - Reconstruction of the bony walls
 - Biopsy (in some indications)
-
- Anterior and mid lesions  Anterior approach
 - Posterior lesions (apex)  Posterior approach
 - Extended lateral orbitotomy
 - Craniofacial approach
 - Combined procedures

1.2. MAIN APPROACHES AND OSTEOTOMY

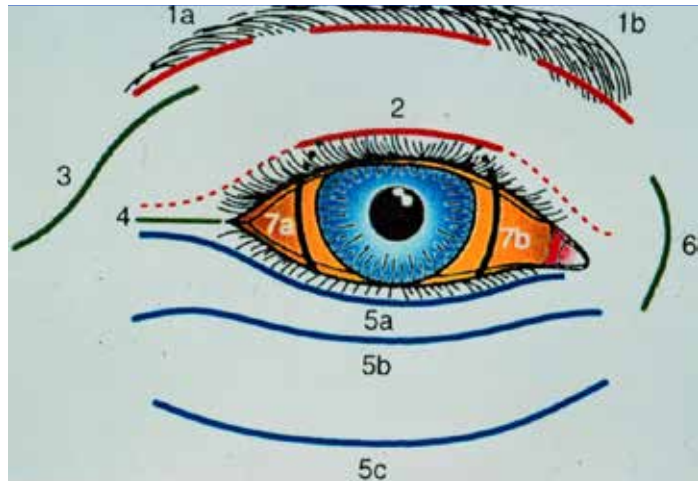
ANTERIOR

- Cutaneous (superior, lateral, inferior, medial)
- Conjunctival
- Coronal



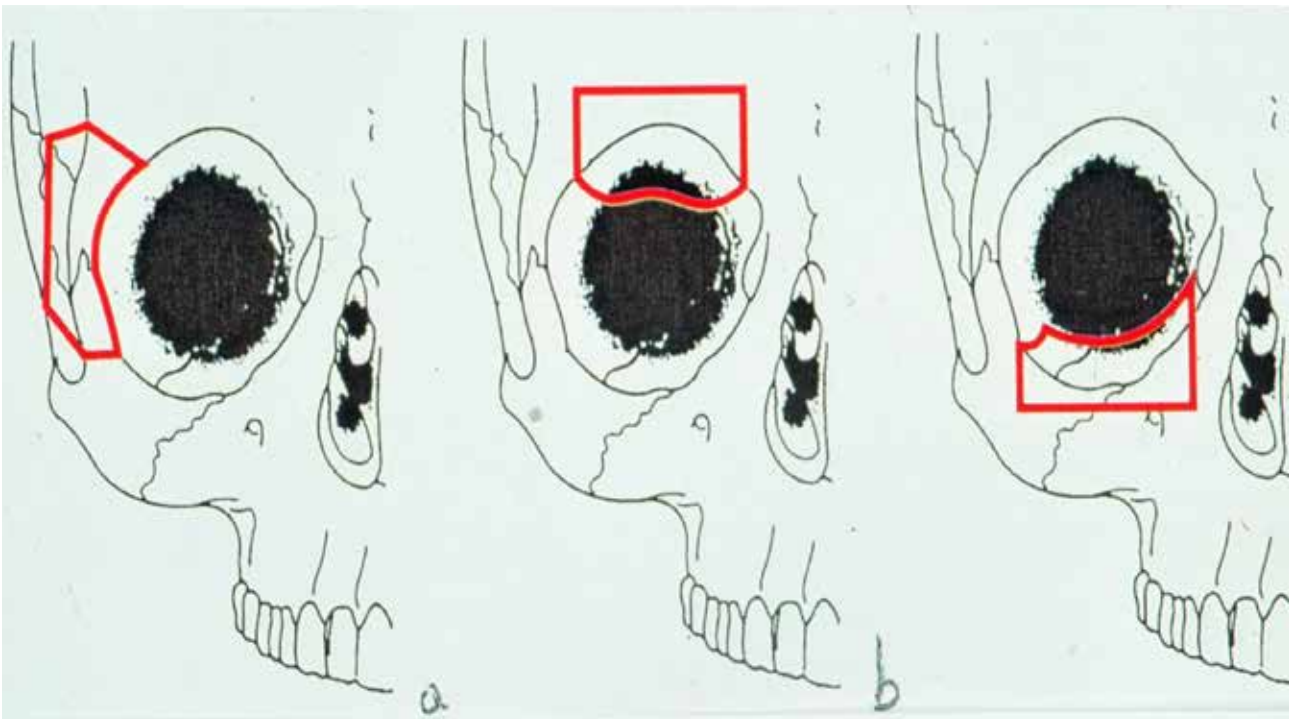
POSTERIOR

OTHER PROCEDURES



*

Main types of osteotomy



Lateral*

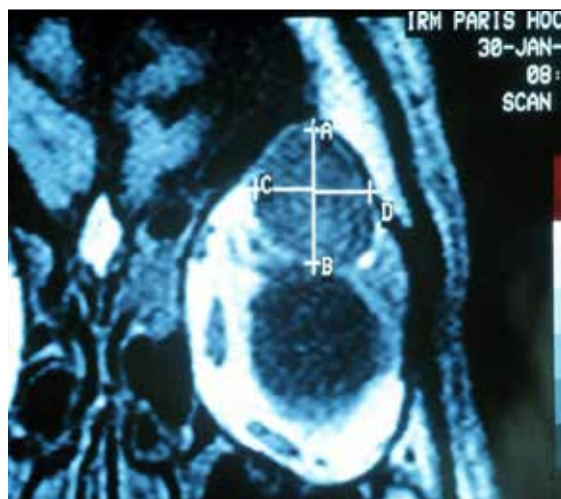
Superior*

Inferior*

* [Ref: SFO report 1998]

1.3. SUPERIOR APPROACH

The superior crease approach



MRI: superior haemangioma



The crease approach



*Opening the septum
Anterior part of the haemangioma*



*To avoid cutting the SOM (Superior Oblique Muscle),
a hook is placed under the muscle.*



The lesion is completely dissected.

Superior crease approach for a neurogenic tumour

In this case, the lesion is very deep near the roof of the orbit. To avoid damage, the surgeon must repair all the structures of the orbit, put hooks under the muscles and gently dissect and mobilize the mass without traction.



Right pseudo ptosis



MRI: superior orbital mass



The approach: a hook is placed under the SOM (Superior Oblique Muscle).



Dissection of the mass



The mass



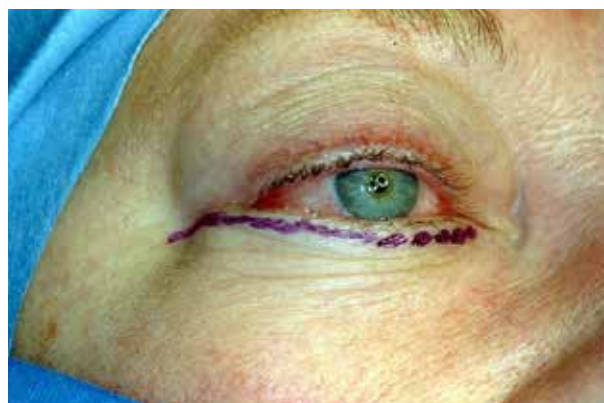
Crease approach suture

01 ORBITAL SURGICAL APPROACH

1.4. INFERIOR APPROACH



1: subciliary approach - 2: crease approach
3: suborbital approach*



Subciliary approach for orbital floor exploration



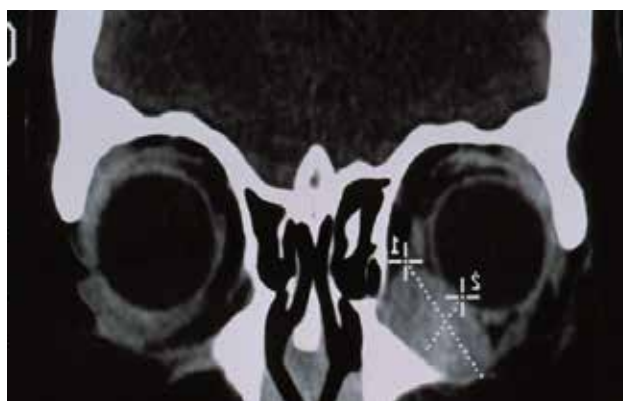
Orbital fat. Orbital rim exposure



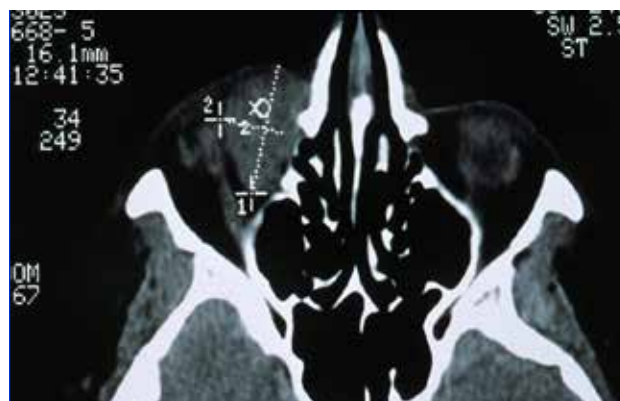
Floor exposure

Suborbital inferior eyelid approach

The lesion was very large, deep and near the bone. The inferior oblique muscle and inferior nerve must be preserved.



CT: coronal view - the mass



CT: Axial view



Mass dissection



Resection of the mass

* [Ref: SFO report 1998]

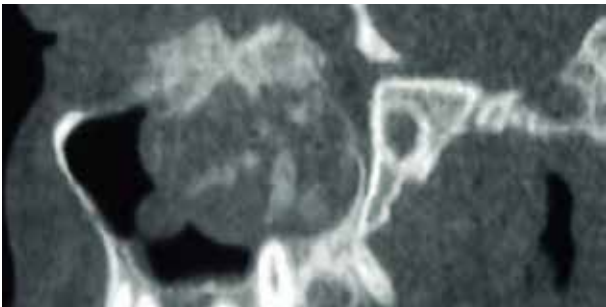
Inferior eyelid approach combined with a maxillofacial approach for a fibro-osseous tumour



CTS: axial view of the mass



Coronal view: the mass destroys the floor



Sagittal view



The tumour

Through this double approach, the surgeon can control the entire orbital floor and the maxillary sinus. Complete resection of the tumour is facilitated.



Inferior eyelid approach



Orbital rim



Floor dissection



Maxillofacial approach



Right proptosis with scleral show



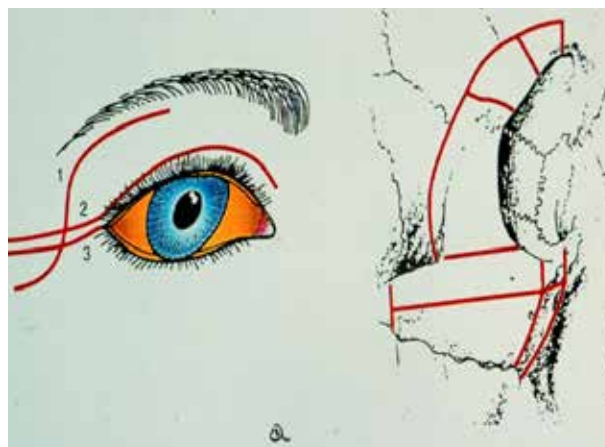
Result after tumour resection

1.5. LATERAL APPROACH

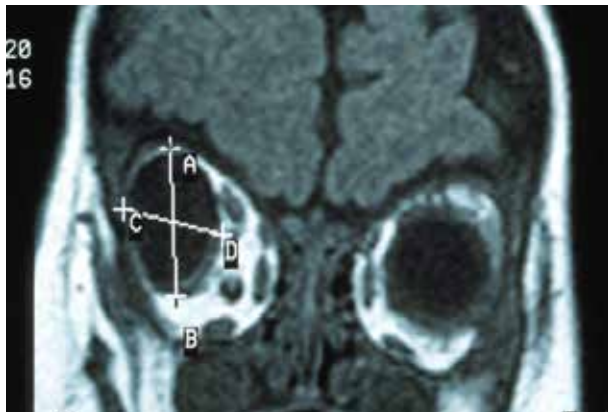
DIFFERENT INCISIONS

- Long S incision
- Upper eyelid crease incision towards the canthus
- Lateral canthus incision

EXTERNAL PILAR DEPOSIT



*

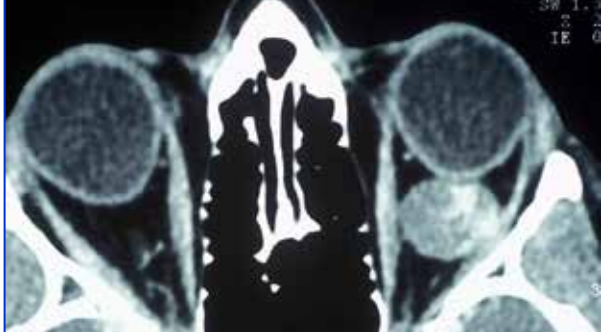


Dermolipoma excision by long S upper eyelid approach

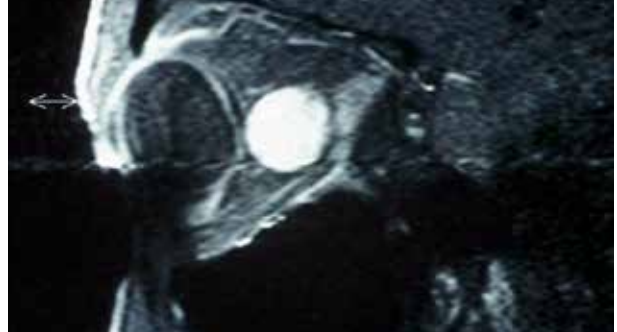
* [Ref: SFO report 1998]

Lateral approach with external pilar deposit

THE CASE: retrobulbar intraconal orbital haemangioma (anterior and mid-orbit). The approach with osteotomy is easy and in case of haemangioma the mobilisation and excision of the mass is generally simple because there is no adherence to the other structures of the orbit.



CTS axial view



MRI sagittal view



a - Skin approach



b - Septum view



c - Lateral orbital rim



d - Osteotomy



e - Lateral orbital rim deposit



f - Haemangioma before mobilisation and excision



g - Reposition of the lateral orbital rim



h - Total excision of the haemangioma



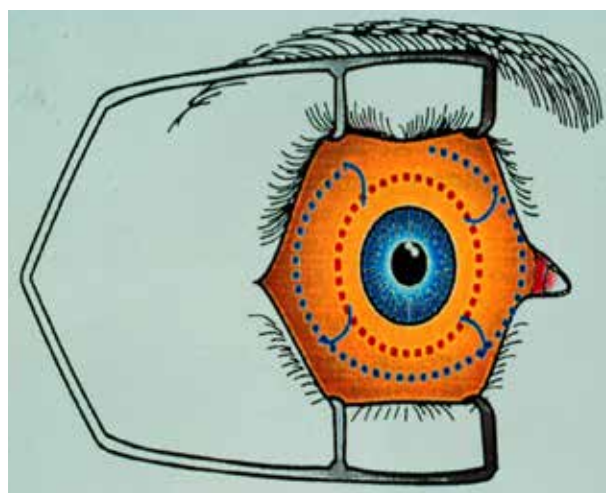
i - Incision before suturing

1.6. CONJUNCTIVAL APPROACH

The main advantage of conjunctival approaches is the absence of visible scarring and maximum access to the contents of the anterior and middle orbit.

Perilimbal incision provides access to the intra-Tenon space; incision of the fornix allows the fatty extraconal space to be approached. This approach is used in blepharoplasty (lipectomy), orbital floor fractures and anterior and middle orbital tumours.

If the approach seems too narrow, it can be combined with an external canthotomy.

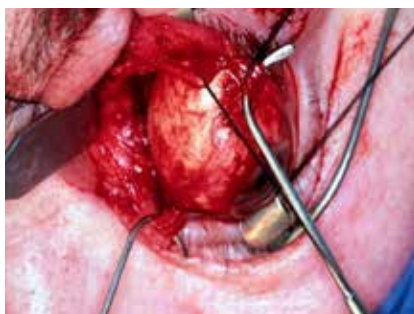


■ parolimbic incision
■ fornix incision*

Conjunctival approach - fornix incision



*Incision in the superior medial fornix.
Traction suture in the superior rectus.
Perform traction of the eyeball
in downgaze.*

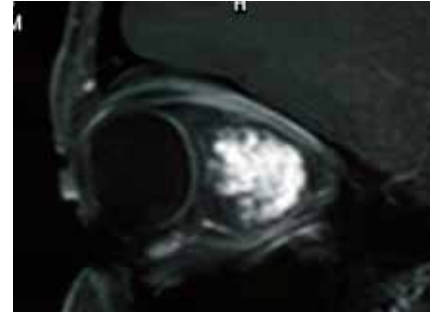
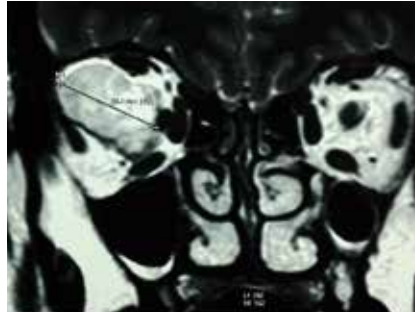
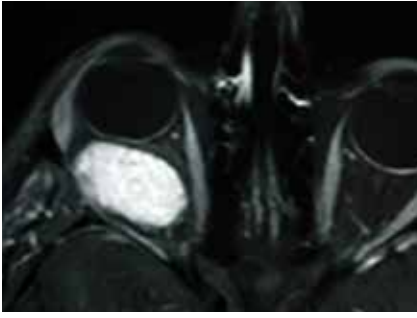


*5/0 silk is fixed to the superior
oblique and rectus muscles.
The dissection becomes
easier allowing better access
to the mass.*



Excision of the mass

* [Ref: SFO report 1998]



T1 MRI: Axial, coronal, sagittal views confirm the diagnosis of haemangioma. Localisation in the mid-orbit, intraconal space, near the lateral wall and the superolateral fornix.



a - Cantholysis



b - Paralimbal incision



c - The approach. Two silk tractions have been placed in the superior and lateral rectus muscles



d - Visualisation of the anterior part of the mass



e - Dissection of the mass



f - Mobilisation of the mass



g - Excision of the mass



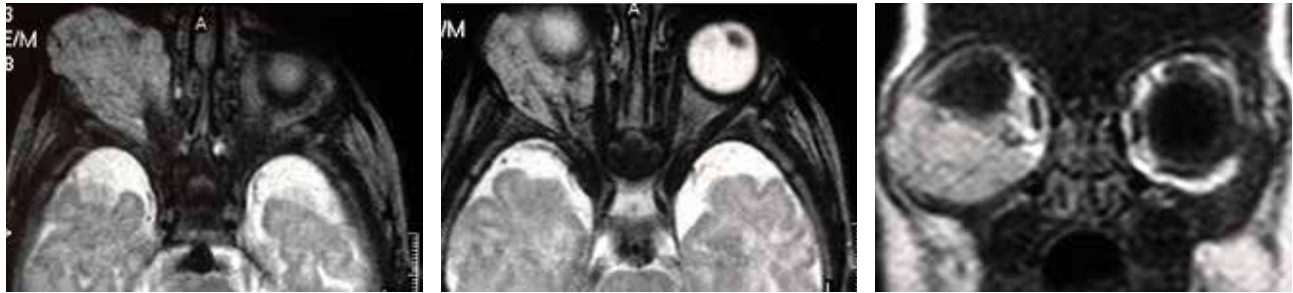
h - After excision. View of the superior fornix.



Excision of the mass

01 ORBITAL SURGICAL APPROACH

Conjunctival approach - fornix incision – cantholysis Treatment of a voluminous immature haemangioma



MRI exploration in coronal and axial planes. Inferior and deep infiltration.



a - Immature haemangioma



b - Conjunctival view of the mass



c - Posterior approach with cantholysis



d - Mass excision



e - Total excision of the mass

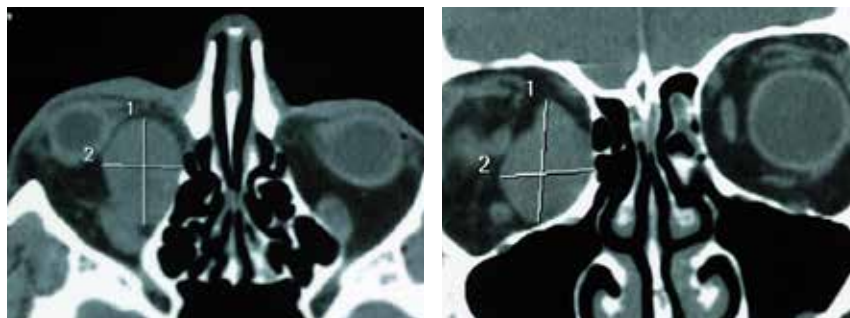


f - Reposition of the eyelid

Medial fornix incision for a large medial and anterior orbital tumour



Right proptosis



CTS: medial and inferior mass



Medial conjunctival incision



Excision of the mass



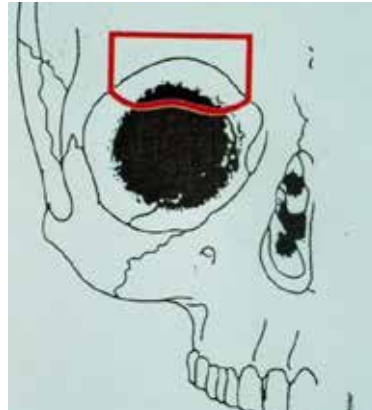
The scar is invisible

1.7. CORONAL APPROACH

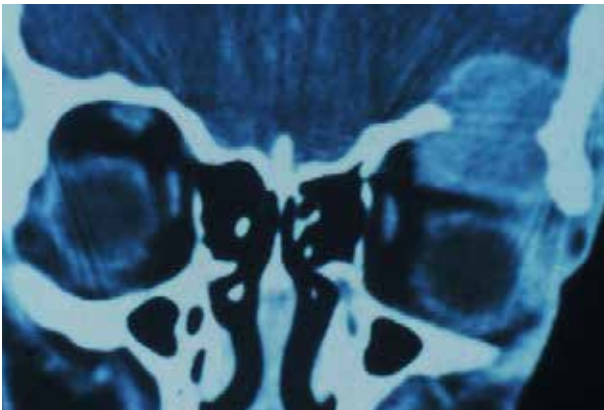
Extracranial osteotomies

- lateral
- superior

Intracranial osteotomies



*Roof osteotomy**



A mass between orbital and cranium



Example of a coronal approach

* [Ref: SFO report 1998]

Coronal approach for a complex orbital-craniofacial tumour

Gardner syndrome with a large osteoma on the cranium and the orbit.



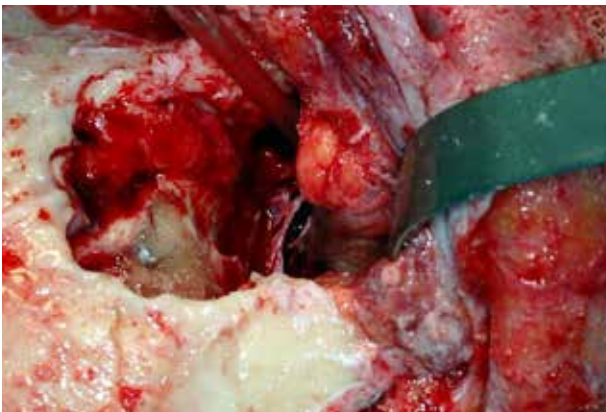
Clinical appearance: frontal view



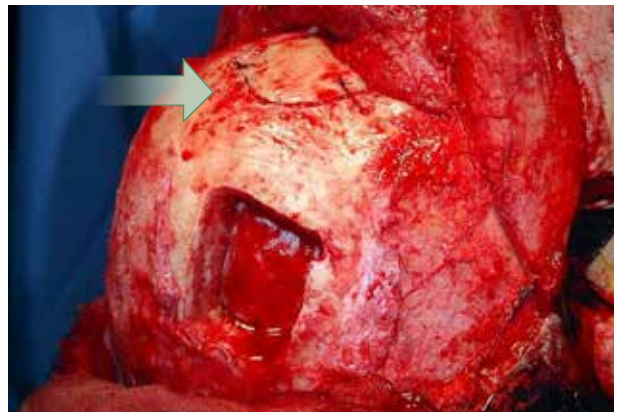
Sagittal view



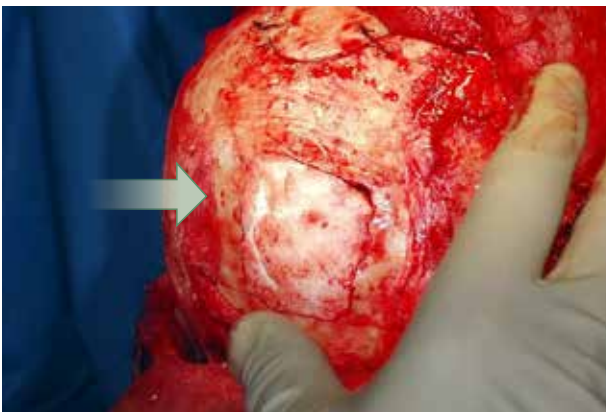
The bony mass after exposure under the periosteum



Resection of the mass



Reconstruction of the defect by a cranium graft



The bone graft defect has been reconstructed with methyl methacrylate (MMA)



Suturing of the periosteum



Final appearance: the coronal approach is masked in the hair

02

ORBITAL TRAUMA & ORBITAL FRACTURES

02 ORBITAL TRAUMA & ORBITAL FRACTURES

Even minimal orbital trauma can affect the eye, the orbit and also the face.

The goals of treatment are to maintain the orbital contents, restore the integrity of its container, which is essential for visual function.

Several clinical aspects may be described depending on whether the container and/or the contents is affected. These may include orbital haematomas, orbital fractures, optic nerve trauma, intra-orbital foreign bodies, and combinations of ocular, orbital, and eyelid lesions.

Management includes a rigorous ophthalmological, maxillofacial and neuro-ophthalmological physical examination.

Imaging is paramount: high-resolution CT in all three planes of the space, and also MRI to study the soft tissues and container/contents ratios.

The orthoptic assessment explores oculomotor imbalances.

2.1. EMERGENCY

Some situations must be urgently treated

IMMEDIATE EMERGENCIES: during a compressive haematoma that may reach the optic nerve are justified for evacuation and decompression.

Exposure of the eyeball due to exophthalmos, eyelid injury.

Wound, eye contusion.

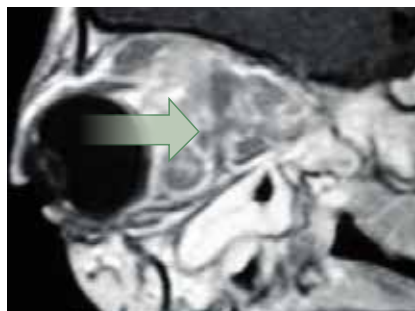
DELAYED EMERGENCIES: foreign bodies, eyelid wounds, orbital fractures.



Exophthalmos due to orbito-frontal fracture – eyeball exposure



Exophthalmos – compressive haematoma



MRI: haematoma – multiple lymphangiomatous cavities



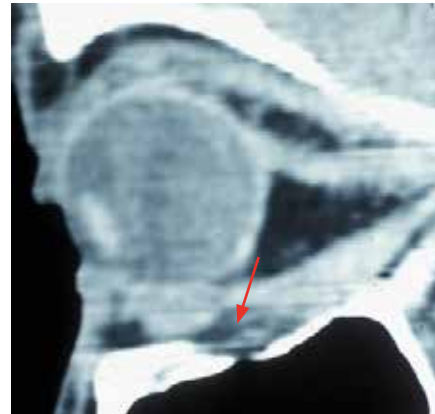
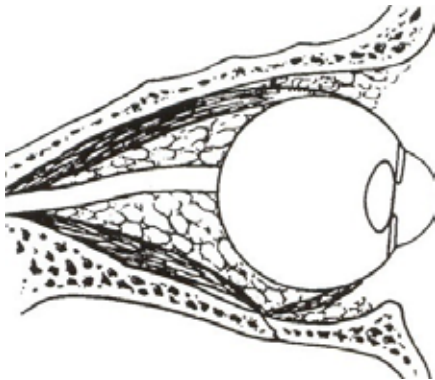
After evacuation

2.2. DIFFERENT TYPES OF ORBITAL FRACTURES

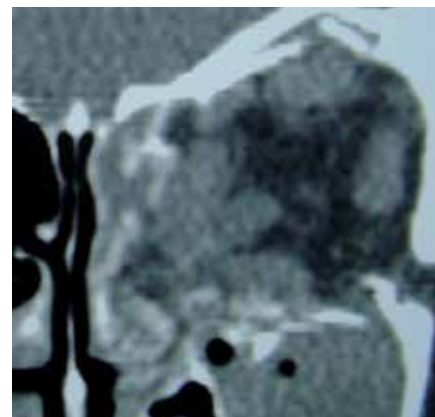
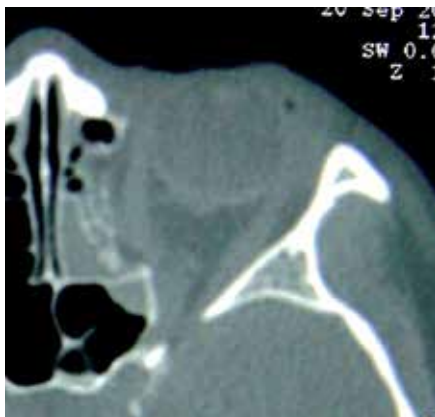
- Orbital floor fracture
- Blowout fracture
- Trap door fracture
- Medial wall fracture
- Orbital roof fracture
- Associations
- External wall fracture: remains rare, occurs in severe facial trauma



*Blowout fracture**



*Trap door fracture**

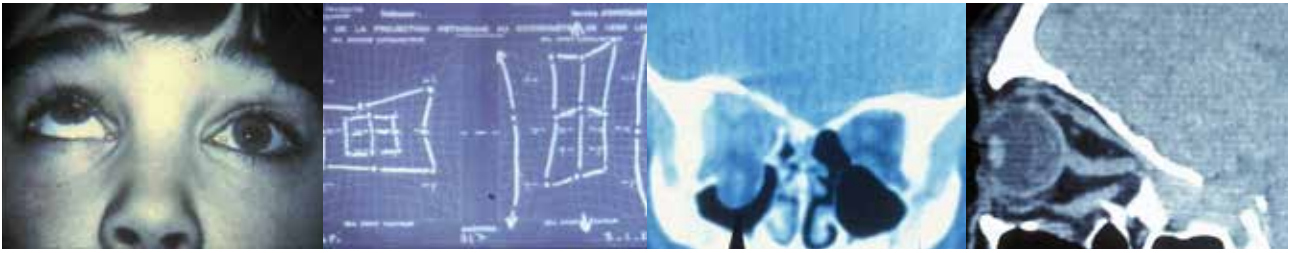


Medial wall fracture

* [Ref: SFO report 1998]

Orbital floor fracture

Orbital floor fracture: common problems include diplopia with limitation of upgaze and downgaze and sometimes enophthalmos.



Limitation of left elevation movements

Incarceration of orbital soft tissue in the maxillary sinus



Trap door fracture: small fracture with pinch of the tissues which explains the diplopia in elevation

Maxillary nasoethmoid fractures With medial wall fracture

MAIN SIGNS:

- Diplopia – limitation of horizontal movements
- Medial dystopia, enophthalmos
- Lacrimal problems
- Nasal obstruction
- Sometimes associated with floor fractures

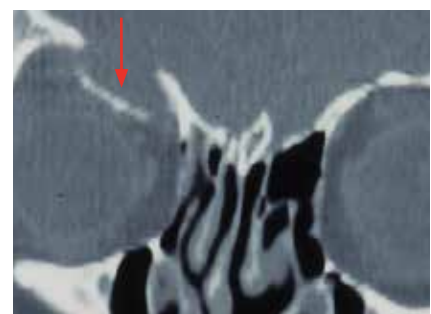


Medial wall fracture with limited right abduction

Posterior medial wall fracture

Orbital roof fractures

- Orbital roof fracture is frequent and responsible for blow-in bone displacement in the orbit, with proptosis and diplopia.
- Combinations of neurosurgical problems are not rare.



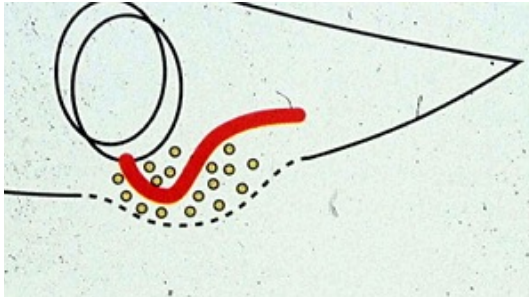
Orbital roof fracture

02 ORBITAL TRAUMA & ORBITAL FRACTURES

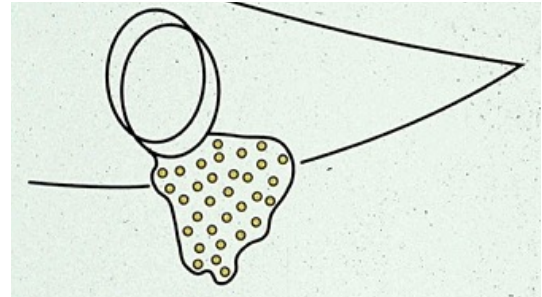
2.3. DIPLOPIA

Mechanical diplopia in orbital fractures

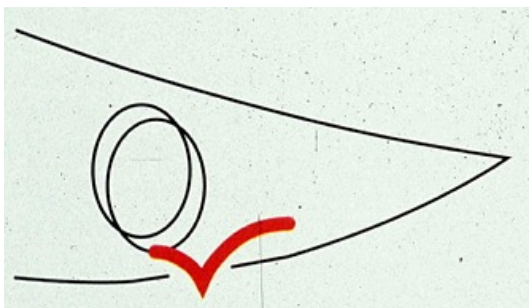
- The most common
- Clinically: early and maximum limitation, forced duction test
- CT scan: diagnosis, sagittal sections



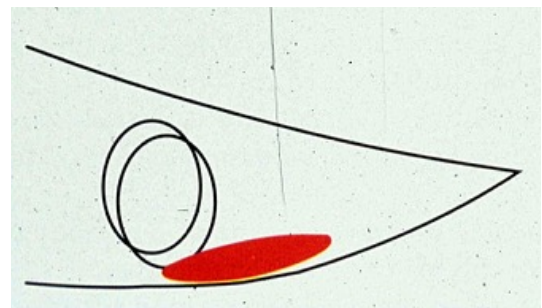
*Orbital oedema or haematoma**



*Support failure**



*Soft tissue incarceration**



*Direct muscular trauma**



No elevation with enophthalmos due to floor support failure and tissue incarceration



Neurological diplopia in orbital fracture

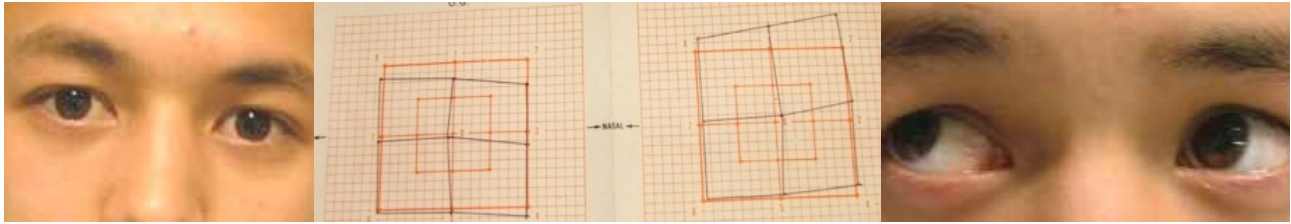
- Oculomotor palsy, nerve damage
- Usually: extraorbital trauma (fourth and sixth nerve palsy)
- Neurological inferior oblique muscle damage
- Wait for surgery; spontaneous resolution is frequent



Orbital trauma with fourth nerve palsy: it is better to wait six months before performing certain surgical treatments

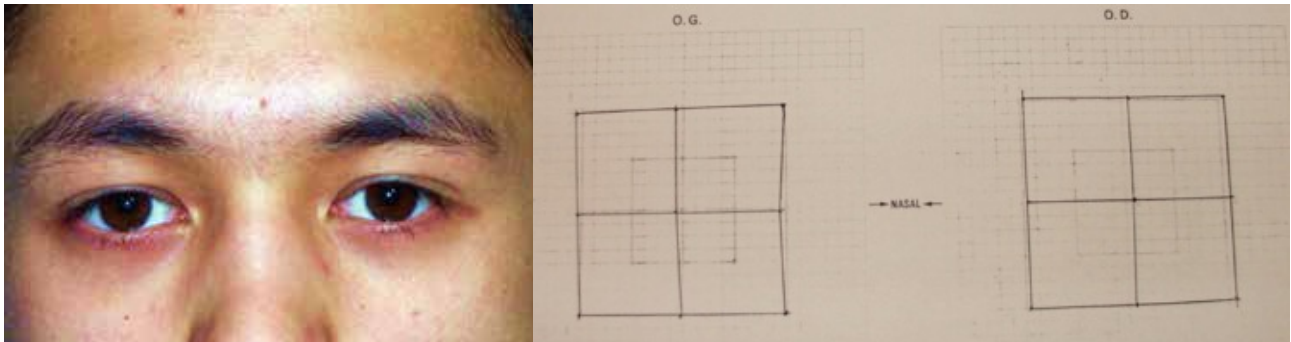
* [Ref: personnal]

Inferior oblique muscle palsy after orbital fracture : “Pseudo-Brown” Traumatic left eye



Torticollis

Upgaze limitation in adduction on the left eye



*Good spontaneous progress in two months
Disappearance of torticollis – normalisation of Lancaster test
No surgery was performed on the orbit*

Orbital fracture and sensory deviation

- Often horizontal deviation, blind or almost blind eye

CLINICALLY:

Large deviation, limited movement, forced duction test: negative



Large right exotropia with poor limitation

2.4. MANAGEMENT OF ORBITAL FRACTURES

Orbital fractures without enophthalmos and/or diplopia can only be controlled and no surgery is indicated.

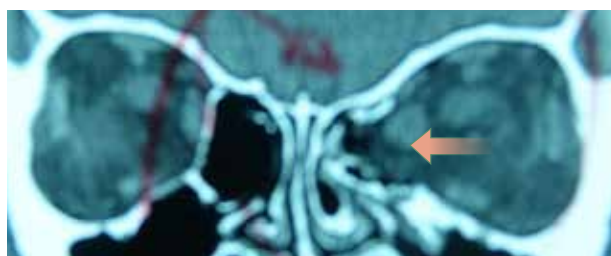
Enophthalmos or diplopia persisting over 15 days leads to surgical management.

Trap door fractures require emergency surgery.

Large medial fracture without enophthalmos and diplopia



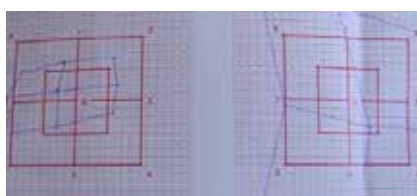
No surgery



In this case, no surgery was indicated. The absence of diplopia can be explained by the significant communication of the soft tissues in the sinus. Thus, there was room for the medial rectus muscle, which can move without limitation.

Non-emergency orbital surgery in orbital fractures

- Surgery is indicated for:
 - morphological damage (enophthalmos, orbital dystopia) with or without oculomotor improvement
 - isolated mechanical diplopia confirmed by imaging and duction test
 - otherwise, oculomotor surgery may be performed later depending on progress
- Surgery should be performed within an optimal time frame, usually between 15 and 30 days after the trauma



*Left floor blow-out fracture with upgaze limitation
Surgical indication*

The trap door fracture is an emergency

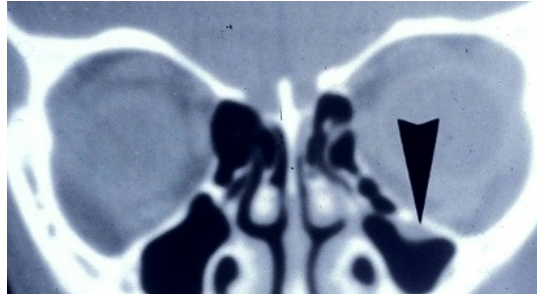
- It often occurs in childhood
- Poor local symptoms
- Important motility limitation in elevation
- "Drop" image on CT scan
- Urgent surgical repair is needed to avoid complications like ischaemia of the muscle and transformation into fibrotic tissue
- Ischaemic risk



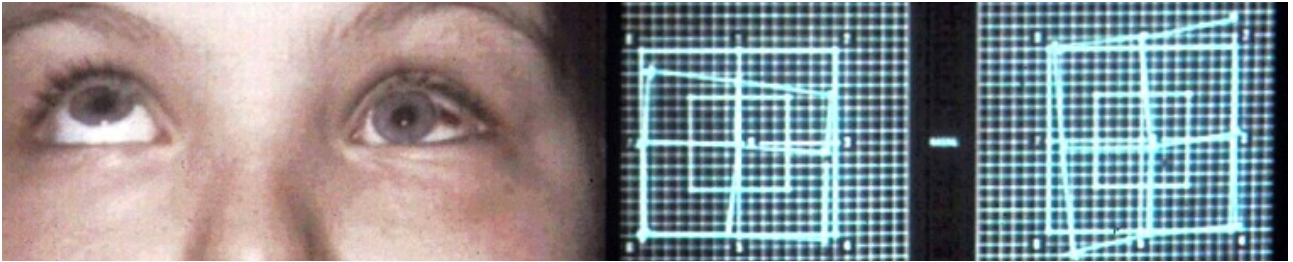
Orbital trauma: just a little haemorrhage



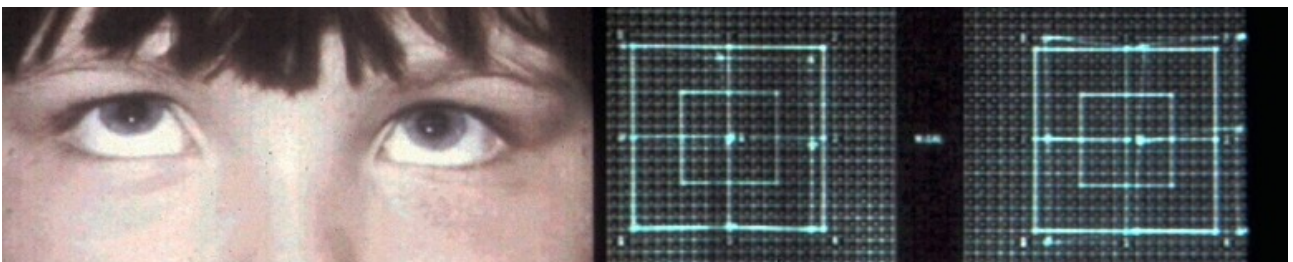
Left vertical limitation



The small fracture



Before surgery: limited elevation



After emergency surgery: normalisation of elevation

Medial wall fracture like a trapdoor floor fracture



Left exotropia with limited adduction



Medial wall fracture with incarceration



Result after release of soft tissue and reconstruction of the medial orbital wall : normal motility

2.5. SURGICAL APPROACH TO THE ORBITAL FLOOR

Conjunctival approach is used for mild fractures. Skin approach (lid crease, subciliary) combined with a canthotomy gives a better view of the floor.

CHOICE OF IMPLANT MATERIAL

- Autogenous bone, cartilage
- Alloplastic materials: Biocoral, hydroxyapatite, Medpor, PDS, Vicryl, etc.



a - Subciliary skin crease approach



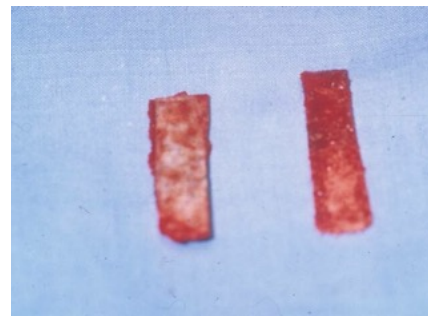
b - Conjunctival approach



c - Biocoral floor implant



d - Biocoral floor implant



e - Bone graft from the cranium

Orbital floor fracture: subciliary skin crease approach



a - Subciliary skin incision



b - Opening the orbicularis



c - Dissection towards the orbital rim



d - Floor dissection with release of the tissue



e - Biocoral graft on the floor

Orbital floor fracture: conjunctival approach



a - Inferior tarsus border injection



b - Traction of the posterior flap



c - Dissection on the septum



d - Exposure of the orbital rim



e - Opening the orbital rim



f - Floor dissection



g - Soft tissue release and reposition in the orbit



h - Graft to close the defect

02 ORBITAL TRAUMA & ORBITAL FRACTURES

Case report



Left floor fracture with enophthalmos and orbital dystopia



Result after orbital reconstruction



Upgaze limitation



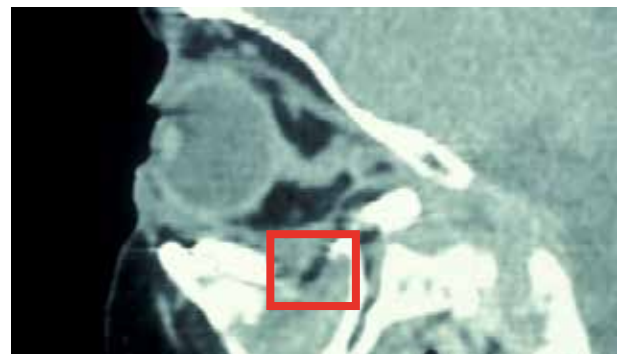
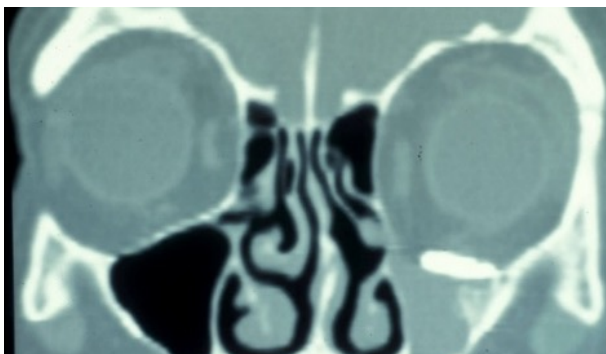
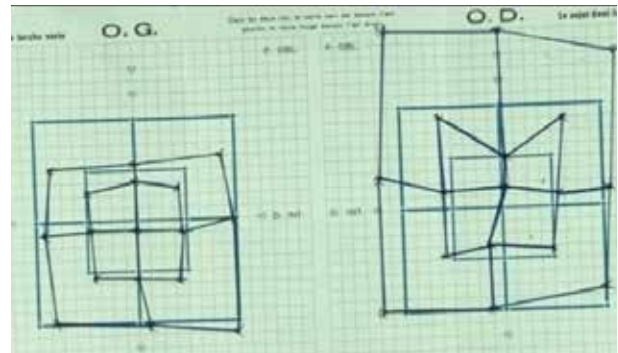
After correction: the support in the floor corrects the enophthalmos and the upgaze limitation

2.6. OPERATED FRACTURES AND DIPLOPIA PROBLEMS

Diplopia can be residual or induced by orbital surgery.

Predisposing factors are: delayed orbital surgery complex fracture such as floor+medial wall combination; posterior floor fracture extension.

The main mechanisms are inadequate extrication, iatrogenic gesture, repair patch displacement, orbital tissue fibrosis, permanent muscle damage, etc.



Orbital patch displacement: diplopia with limited upgaze. On CT the patch is malpositioned and fails to support the inferior rectus muscle.

Post-operative hypertropia syndrome

This condition may be observed:

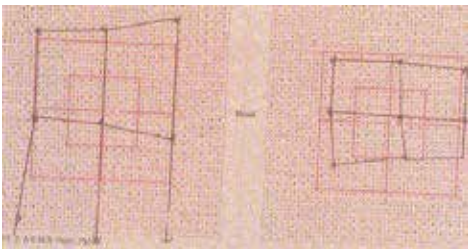
- After posterior orbital floor fracture repair.
- The cause is transient inferior rectus weakness.
- Frequently spontaneous improvement is observed.



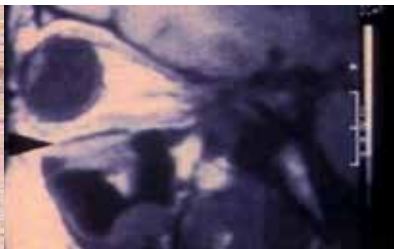
Right hypertropia one day after correction of a posterior floor fracture



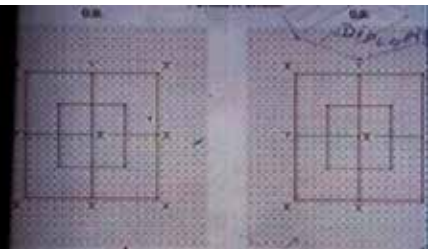
Normalisation after two months



Inferior rectus muscle palsy



*Normalisation on Lancaster.
The MRI shows the inferior rectus muscle in the proper position.*



Muscle fibrosis syndrome

It occurs more frequently in small posterior floor fractures, trap door fractures which have not been urgently operated.

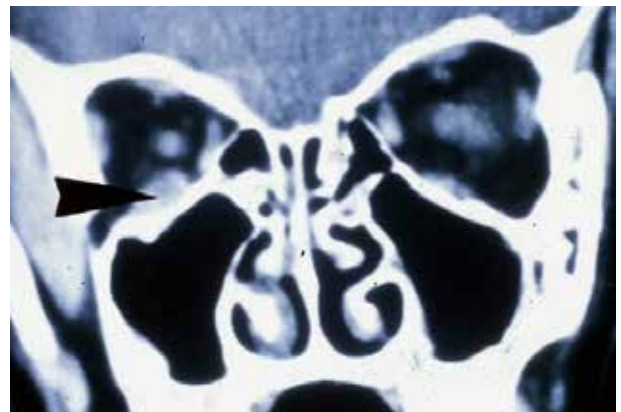
CT scans show an enlarged muscle.

During surgery avoid compressing the tissues and avoid placing the graft posteriorly near the apex.

Cortisone can be used.



Limitation of upgaze after orbital floor surgery.



Large muscle on CT.

2.7. UNOPERATED ORBITAL FRACTURES

The residual injuries of unoperated orbital fractures are orbital dystopia and/or diplopia.

The first treatment is to correct the enophthalmos. Diplopia that persists is treated in a second stage.

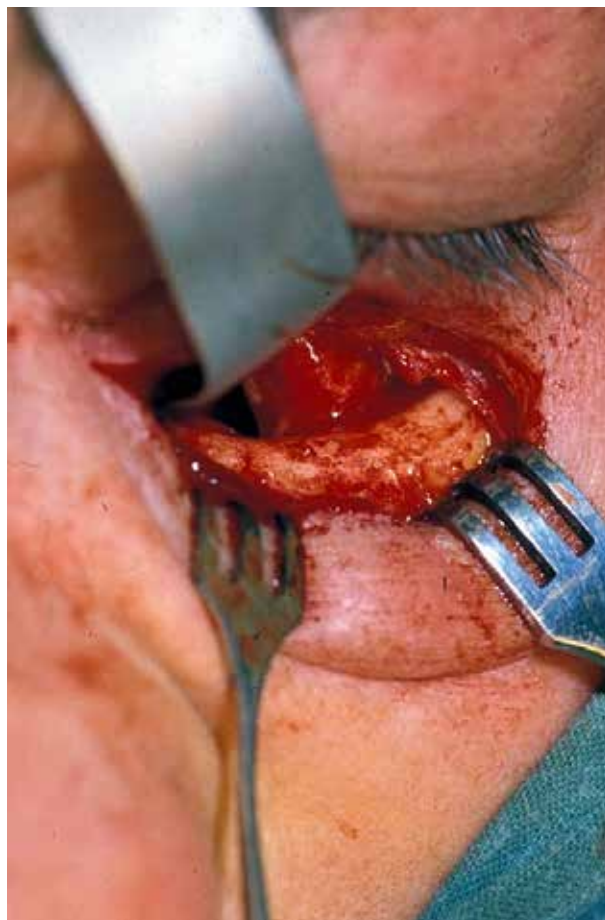
When there is a large deficit of the floor with enophthalmos and diplopia due to lack of support for the inferior rectus, reconstruction of the floor with reintegration of the soft tissues in the orbit can yield excellent result even if surgery is performed several months after the initial trauma.



Left enophthalmos by floor orbital fracture, never operated.



Limited upgaze



*Late exploration of the orbit
Large incarceration*

Late surgery for unoperated fractures



Right enophthalmos. Correction by bone graft on the orbital floor.



*Large left floor defect with enophthalmos and hypoglobus
Reconstruction with a bone graft performed long after the initial trauma.*

CONCLUSION

- Trap door fracture is an emergency.
- The role of medical imaging in the management of orbital fractures is essential:
 - CT scan during the initial period
 - MRI for the soft tissue and residual diplopia, particularly sagittal sections to explore the inferior rectus course.
- Diplopia is a common complication of orbital fracture and orbital repair.
- A large bone defect leads to a smaller risk of diplopia but enophthalmos.
- Larger bone defects are associated with a lower risk of diplopia but a higher risk of enophthalmos.
- If no diplopia is present immediately after trauma, later diplopia generally does not develop if the fracture is left unoperated.
- Conversely, orbital surgery can induce diplopia.
- Diplopia that persists in the primary position and on downgaze is treated in a second phase by strabismus surgery after a reasonable delay.



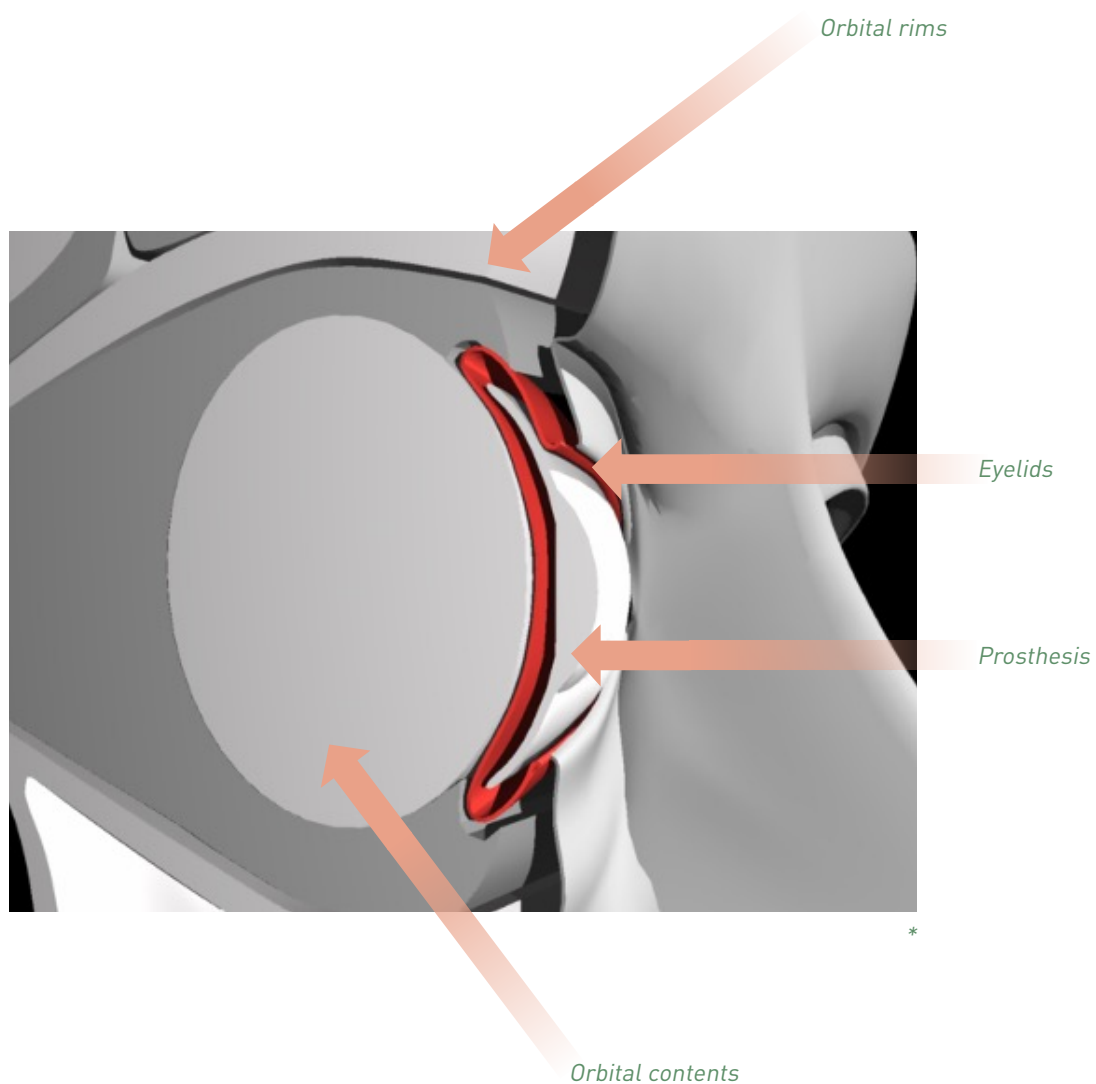
ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

Most socket problems are related either to a contracted socket or to a volume deficit following loss of the eye globe.

There are many different situations and surgical procedures depending on the pathology: post-enucleation socket syndrome, implant extrusion, contracted socket, eyelid malpositions, etc.

Anatomy of the conjunctival bag



* [Ref: personal]

3.1. POST-ENUCLEATION SOCKET SYNDROME

It is a combination of enophthalmos, deep upper eyelid sulcus with ptosis, malposition of the lower eyelid with laxity.

In case of enucleation/evisceration, there is a volume deficit.

Volume replacement is corrected by a primary intraorbital implant or a secondary implant (if there is no primary implant or implant with inadequate volume). Orbital floor implants can be used to supplement orbital volume. Then, an adequate prosthesis is fitted.

If the implant is too small, the prosthesis must be larger to compensate and correct the volume, but often with a negative repercussion on the eyelids.

The best solution is to find a good balance between the implant and the prosthesis.

Eyelid surgery is indicated for residual malpositions when the prosthesis is in good position.

Orbital implants

Choice of implants:

- PMMA, silicone, biocolonizable
- Medpor, hydroxyapatite, Biocoral implants
- Dermofat grafts

Size of implants:

- Ideally around 20 mm for a normal eye

Implant coverage in case of extrusion:

- Autogenous graft (temporal aponeurosis, mucosal graft or flap)
- Biomaterials: Mersilene mesh, PTFE, Vicryl mesh, etc.



Conservative sclera to cover an implant



Hydroxyapatite implant



Hydroxyapatite implant covered by sclera except for the posterior part



Dermofat graft

Post-enucleation socket syndrome

- Loss of orbital volume —→ intraorbital implant and dermofat graft
- Deep sulcus —→ dermofat graft and lipostructure
- Eyelid malpositions —→ ptosis correction; lid laxity: canthoplasty



Deep sulcus



Correction by dermofat graft



Ptosis after the graft

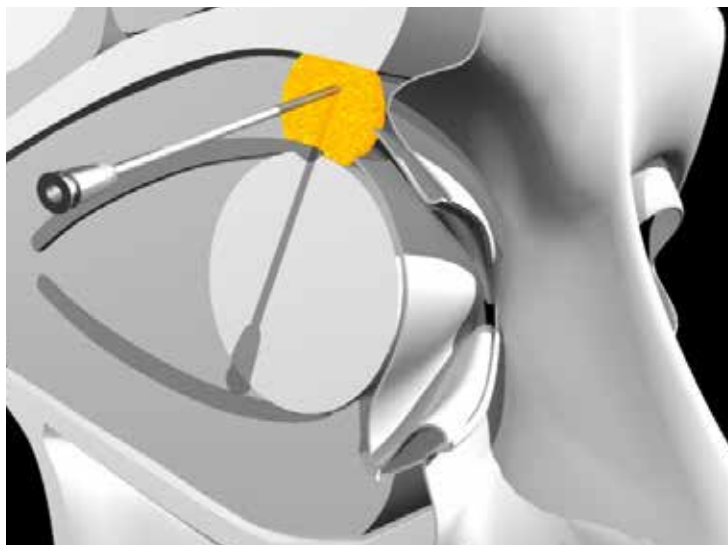


Ptosis correction – final result

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

Deep upper eyelid sulcus

Dermofat Graft in the Sulcus



*

Deep upper eyelid sulcus

Treatment by Dermofat Graft



a - Mark the incision in the crease



*b - Dissect the preaponeurotic space
Before putting the graft*



*c - Place the fat graft
at the back after volume reduction*



d - Close the skin



e - Control margin and prosthesis

* (Ref: personnal)

Deep upper eyelid sulcus Correction using lipostructure



Upper layer – triglycerides

Middle layer – adipocytes

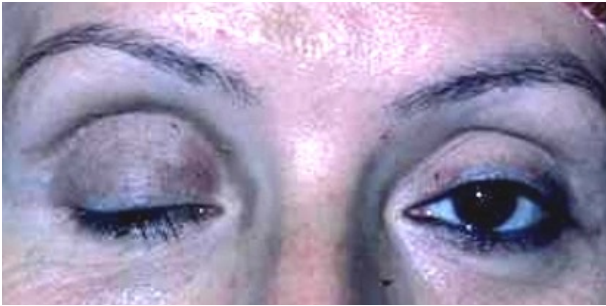
Lower layer – blood



Some aspects before and after surgery

3.2. EYELID MALPOSITIONS AND SOCKET

The most frequent upper eyelid malposition is ptosis (see Chapter 1.3 on ptosis surgery).
Correct the ptosis on the prosthesis with an acceptable orbital volume.
If a residual deep sulcus remains, correct it with lipofat graft or a small dermofat graft



Before and after ptosis surgery on the prosthesis

Ptosis and socket surgery



*This case is the illustration of what to avoid.
The defect of the orbital volume was compensated
by an excessively large prosthesis, which gives
a pseudo-appearance of proptosis.*



*The solution was to fit a new, smaller prosthesis
which induces ptosis.*



*Then to correct the ptosis surgically.
Final result*

Upper eyelid malposition and deep sulcus



Cicatricial upper eyelid retraction on a prosthesis



Correction by cartilage graft for a small, deep sulcus



Final result after dermofat graft in the sulcus



Lower eyelid malposition and socket



Left lower eyelid. Cicatricial entropion due to prosthesis – correction by dermo graft on the posterior lamella.



Before surgery



After surgery

3.3. IMPLANT EXTRUSION

Multiple factors may be responsible for implant extrusion :
Inadequate size and/or type of implant, poor fixation, conjunctival tissue defects, etc.

IN MILD EXTRUSION

- Close the defect and cover it mucosal flap or graft

IN SEVERE EXTRUSION

- Change the implant
- Rebuild the volume (dermofat graft)
- Close the defect with:
 - Dermofat graft
 - Temporal fascia graft

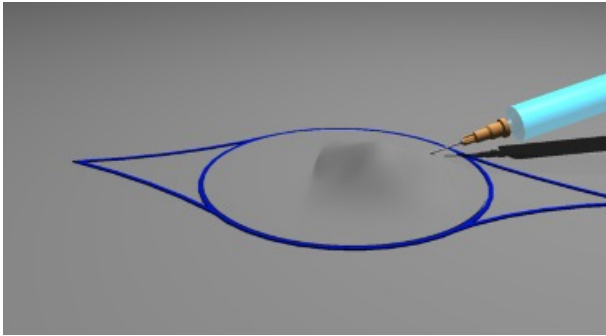


Mild anterior extrusion

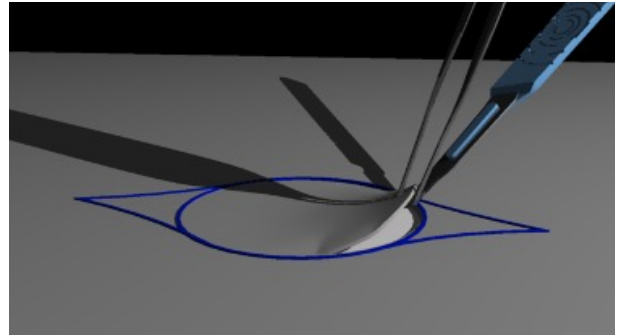


Complete extrusion

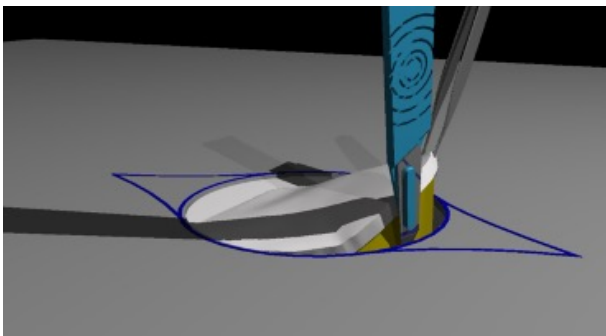
Dermofat graft to rebuild orbital volume In severe extrusion – harvesting the graft



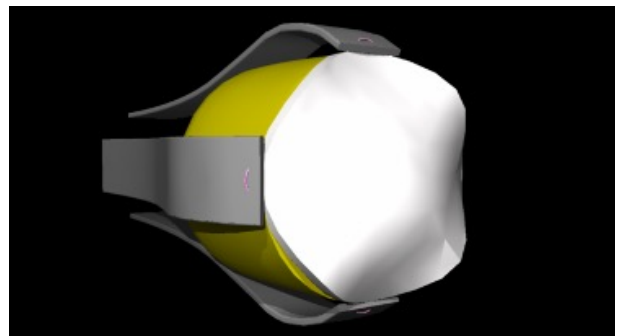
Mark a banana-shaped ellipsis on the buttock skin*



Shave the epidermis*



Cut through the dermis into the fat to a depth of about 25 mm*



Dermofat in the orbit, fat at the back, dermo in front*

Dermofat graft in severe extrusion



a - Extrusion



b - Orbital cavity exposure after complete extrusion – dermo graft



c - Dermo graft in the cavity
– fat at the back
Dermo in front



d - Fix the fibrous tissue to the periphery of the derma and mobilise the conjunctiva to suture to the graft.



e - Conformer to maintain the fornix

* (Ref: personnal)

3.4. CONTRACTED SOCKET

A contracted socket may be congenital or acquired due to trauma, inflammation, radiotherapy, etc.

Mild degrees of contraction may cause an entropion or shallow fornices, which make retention of a prosthesis difficult.

In more severe cases, the socket is virtually absent. Socket expansion is usually possible with grafts.

Contracted socket



*Contracted socket
Inferior fornix absent*



Complete contracted socket



Inferior retraction due to shallow inferior fornix

Classification and surgical procedures

A- MILD



Entropion surgery
Lateral control sling

B- MODERATE



Mucosal membrane graft

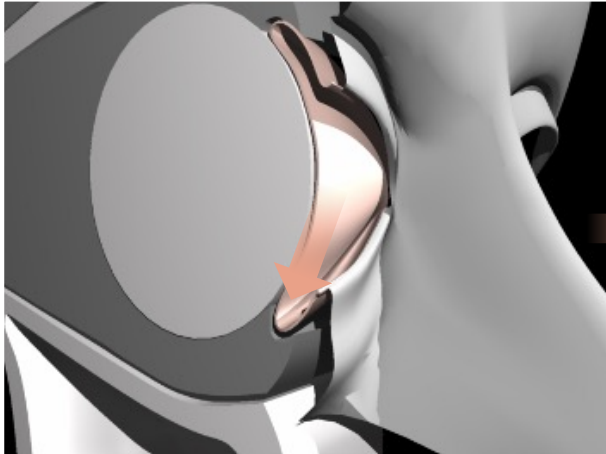
C- SEVERE



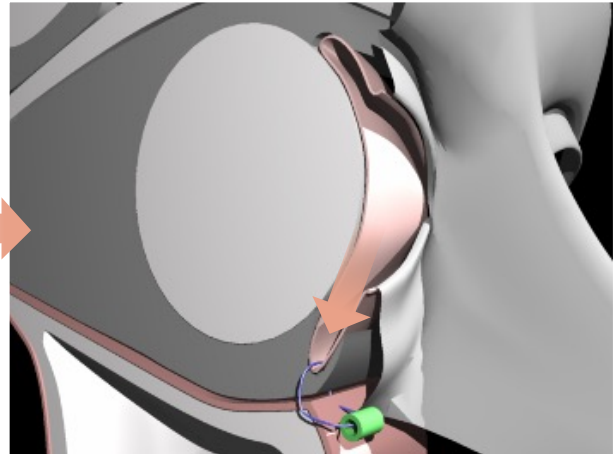
Mucosal membrane graft (moist socket)
Skin grafts (dry socket)

A- Mild degree of contracted socket

1. Entropion correction
2. Fornix-deepening sutures
3. Lateral canthal sling



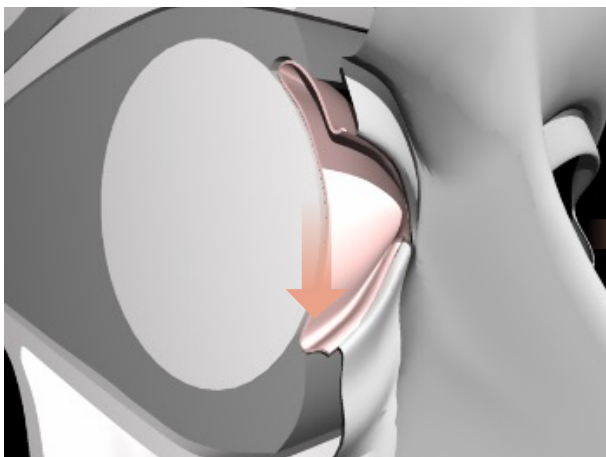
*Shallow inferior fornix**



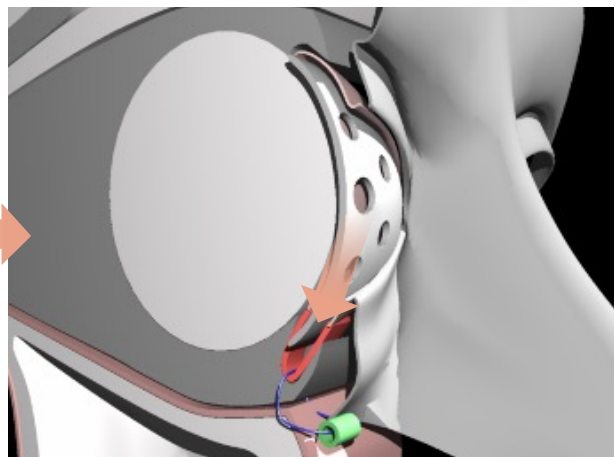
*Fornix-deepening sutures**

B- Moderate degree of contracted socket

1. Mucosal grafts / amniotic membrane
2. Fornix-deepening sutures
3. Conformers
4. Tarsorrhaphy



*Shallow fornix**



*Mucosal graft to depth the inferior fornix**

* [Ref: personal]

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

Mucosal graft for shallow inferior fornix



Inferior labial incision



After excision, the graft bed can be left to granulate



Graft should be as thin as possible



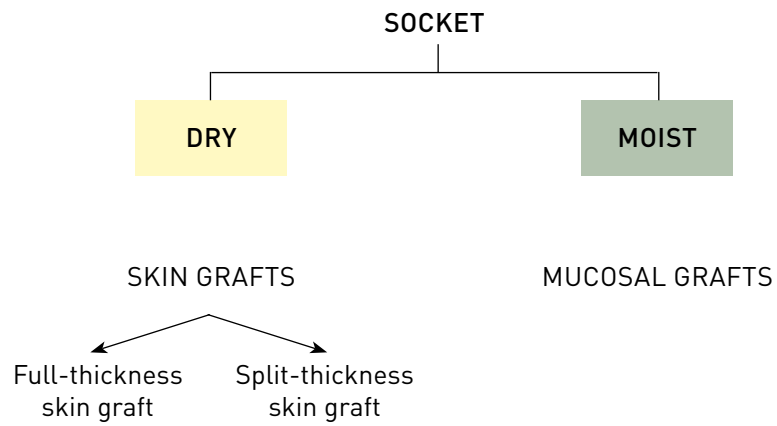
Two grafts to rebuild a large defect



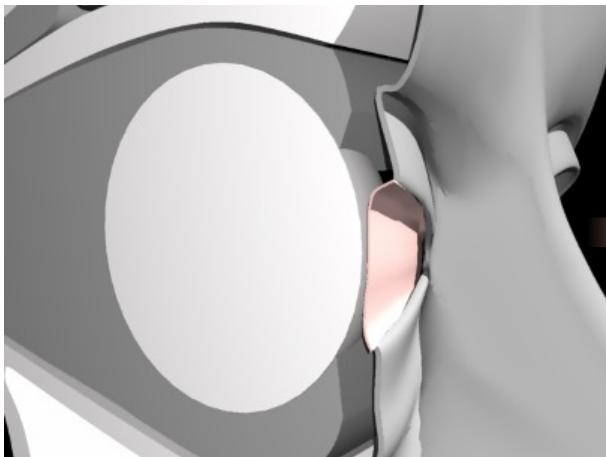
Before and after surgery

C- Severe degree of contracted socket

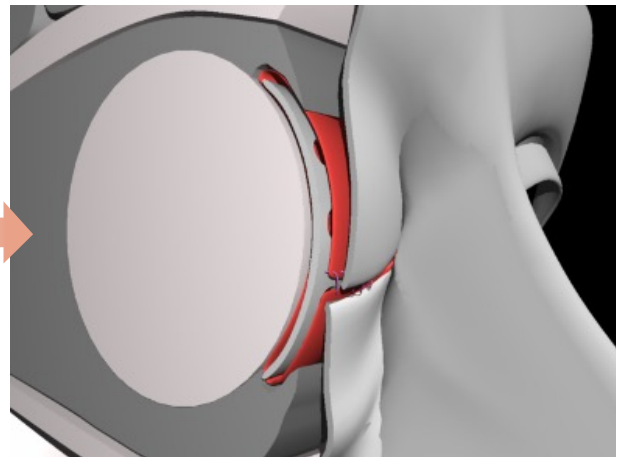
1. Graft



2. Tarsorrhaphy for six weeks



*Complete socket retraction**



*Complete socket reconstruction with graft (in red) on a conformer and tarsorrhaphy**

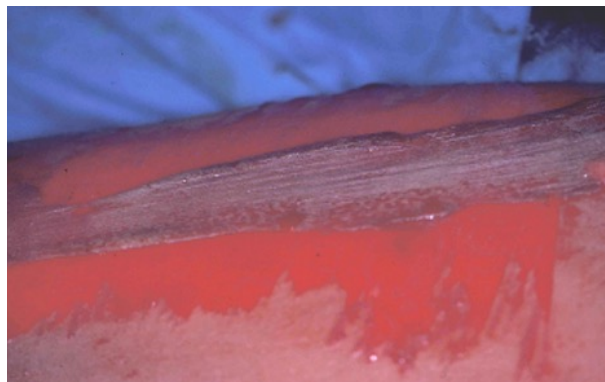
* [Ref: personal]

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

Reconstruction using skin graft for a severe contracted socket



Severe contracted socket after burn



Removal of a split-thickness skin graft from the arm



Split-thickness skin graft



Graft wrapped around a conformer with raw peripheral surface



a - Total socket retraction



b - After opening the socket and excising scar tissue, the conformer is buried in the socket. A tarsorrhaphy is done for six weeks.



c - After opening the tarsorrhaphy



d - New cavity with skin

Result after reconstruction by skin graft for a severe contracted socket



Before

After

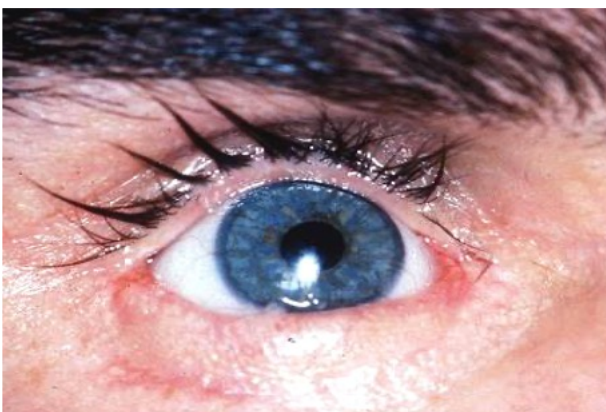
Socket and eyelid reconstruction



Ocular trauma with lower eyelid necrosis



Orbital implant reconstruction after enucleation and lower eyelid reconstruction by flap



Results

3.5. ORBITAL RECONSTRUCTION AFTER EXENTERATION

Orbital exenteration is a surgical procedure indicated for carcinology of the orbit region. It consists of excising the orbital contents. Tissue resection may be partial, total, extended.

Management of the orbital cavity after exenteration is challenging: surgical reconstruction, epithesis fixed to eyeglasses or fixed directly to the orbital bone by integrated osteosynthesis.

If the orbit contents have been irradiated without exenteration, temporal depression may sometimes occur.



Partial exenteration



Left temporal depression after irradiation

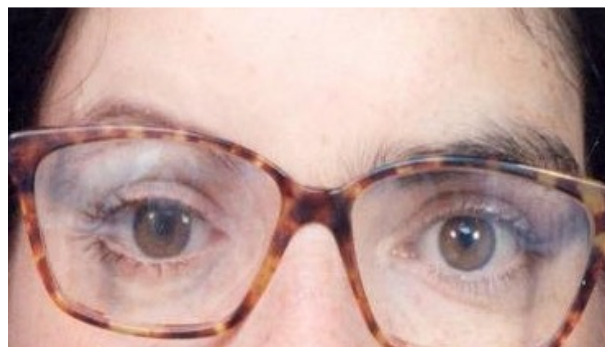
Epithesis fixed on osteointegrated fixture after complete exenteration



Fixtures in the bone

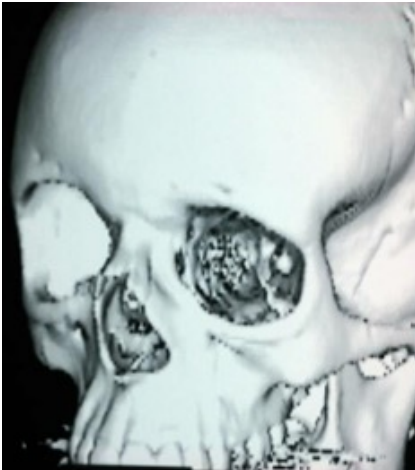


Epithesis



Glasses increase the result

Irradiated orbital cavity – temporal fossa volume loss – filling with PMMA (polymethyl methacrylate)



Temporal fossa



Left temporal depression



Drawing of the depression



Temporal fossa dissection. The temporal muscle is reclinated.



PMMA implantation



Temporal muscle reposition

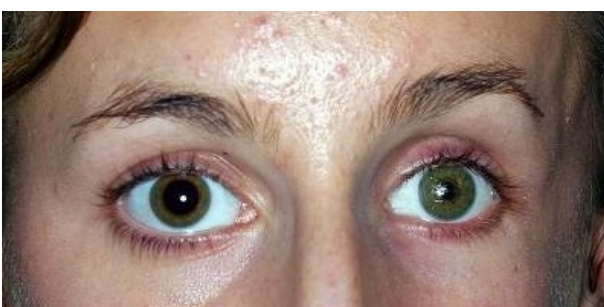
Temporal fossa volume loss – filling with PMMA



Before



After



Before



After

3.6. ANOPHTHALMOS AND SEVERE CONGENITAL MICROPHTHALMOS

- There are many different situations. Management begins with a clinical examination of the orbital contents (eyeball present or not, socket and fornix, eyelid malpositions or malformations; horizontal, vertical and axial dimensions of the orbital bone, etc.).
- X-ray investigations are essential: CT for the bone, MRI for the soft orbital tissues.
- Conformers of increasing size should be fitted to try to stimulate growth of the orbital walls as well as to expand the soft tissue socket.
- If it is impossible to retain a conformer in the socket, orbital surgery may be required on the walls of the bone and/or socket depending on the case.

Clinical presentation



Severe micro-orbitism: Reduction of the vertical and transverse diameter



Micro-orbitism with microblepharia and small socket



Micro-orbitism with socket, which supports a prosthesis



Micro socket with microblepharia



Socket with fibro tissue



Microphthalmos with lower eyelid coloboma

If the socket retains a prosthesis

- Treatment includes dilation of the socket and eyelids using progressively larger conformers
- Between the first months of life and 18 months old
- Delay of surgery
- Expanders?



Microphthalmos. Result after conformer treatment and prosthesis. No surgery.



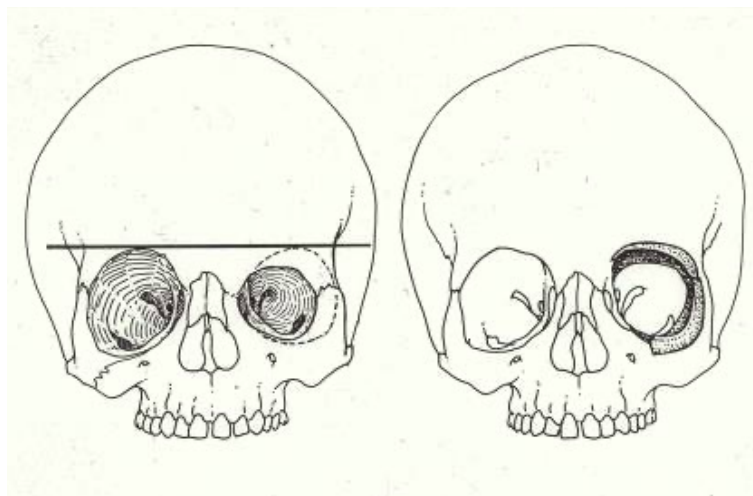
Microphthalmos with microblepharia. Dilation of the socket and eyelids. Result with prosthesis.

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

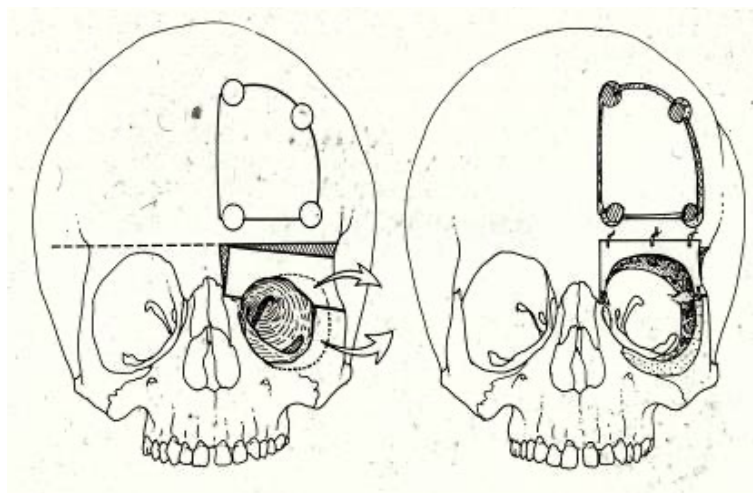
If the socket does not retain a prosthesis

Surgical expansion of the micro-orbitism and the soft tissues

- Orbital skeleton expansion
 - Extracranial approach
 - Intracranial route
- Socket expansion
 - Mucosal graft
 - Skin graft
- Conformer + tarsorrhaphy



*Extracranial approach**



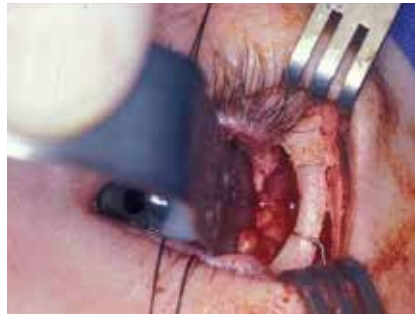
*Intracranial route**

* [Ref: personal]

Skeletal expansion by extracranial route with socket mucosal expansion



*Exposure by canthotomy.
Lateral orbital rim.*



Reduction of the lateral orbital rim



*Conjunctival expansion
for the new cavity*



*Suture between mucosa
and periosteum to cover the bone*



Canthotomy suture



Microphthalmos with severe microblepharia



*Reconstruction by lateral skeletal expansion, socket
expansion with skin graft, eyelid reconstruction by flaps*



Severe left microphthalmia before and after skeletal and socket expansion

3.7. SOCKET PROBLEMS WITH EYELID MALFORMATIONS

- Often associated with anophthalmos, microphthalmos and clefts
- Prosthesis fitting is impossible in the socket
- Colobomas of the eyelids must be treated

SURGICAL TREATMENT

- At the same time :
 - Orbital bone expansion (micro-orbitism)
 - Socket expansion (atresic socket)
- At the same time or in a second phase
 - Eyelid expansion by flaps (microblepharia)

3.7.1. MICROPTHALMOS WITH LOWER EYELID CLEFTS



Microphthalmos with lower eyelid coloboma



Lower eyelid reconstruction with conjunctival recovery on the eyeball



Conformer in the socket



Final result

3.7.2. CRYPTOPHTHALMOS SYNDROME

- Cryptophthalmos is a genetic disease characterized by fusion of the eyelids, covering the eyeball and socket with absent eyelid fissures.
- Namely the skin of the forehead is continuous with the skin of the cheek. The eyeball is present but nonfunctional, but with normal volume. It can be unilateral or bilateral, isolated or syndromic, complete, incomplete or abortive (congenital symblepharon).
- Treatment must create a new socket depending on the reconstruction of the eyelids.



Complete cryptophthalmos



Partial cryptophthalmos



Congenital symblepharon

Surgical treatment of cryptophthalmos (congenital symblepharon)

- Depends on the anatomical form
- Conservative with the eyeball (orbital volume)
- Socket expansion using mucosal graft
- Eyelid reconstruction using flaps
- Complementary surgeries
- Ocular prosthesis



*Fusion between the "pseudo upper eyelid skin" and the eyeball.
The lower eyelid is present.
The volume of the globe is normal.
There is no socket.*

03 ORBITAL SOCKET AND CONJUNCTIVAL BAG SURGERY

T1: Socket expansion by mucosal graft – conservative eyeball – upper eyelid reconstruction using the lower eyelid



a - Excision of the skin fused with the eyeball



b - Exposure of the eyeball with a normal volume



c - Socket reconstruction by mucosal graft with a conformer



d - Full-thickness lower eyelid flap with lateral pedicle



e - Flap



f - 180-degree rotation flap for the future new upper eyelid

T2: Upper and lower eyelid reconstruction



a - Three weeks later the pedicle is controlled. Drawing of a nasojugal flap to rebuild the lower eyelid.



b - Sectioning of the pedicle and reconstruction of the upper eyelid. Dissection of the nasojugal flap.



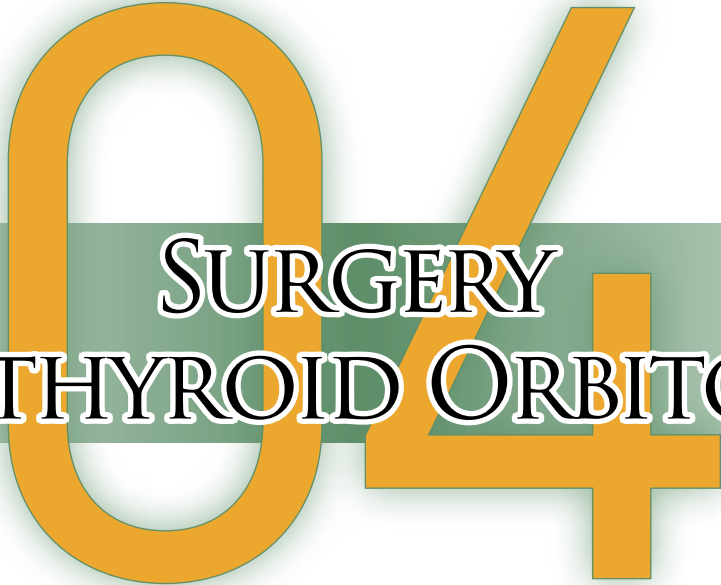
c - Lower eyelid reconstruction by transposition of the flap.



d - Conformer on the new socket recovered by mucosa. Retention of the conformer by the new eyelids.



Before and after two phases of surgery



SURGERY OF DYSTHYROID ORBITOPATHY

4.1. GENERAL CONSIDERATIONS

Dysthyroid orbitopathy is a disfiguring disease affecting the upper part of the face and causing significant changes in gaze. The impairment predominates in orbit and eyelid region, resulting in exophthalmos, oculomotor disorders and eyelid abnormalities to varying degrees. Severe forms occur in 10% of patients.

The medical and surgical management of these severe forms is complex and justifies a first resort to corticosteroid therapy and/or orbital radiotherapy.

The second stage is surgical and follows a symptom-based chronology: orbital decompression followed by oculomotor surgery then eyelid surgery. Each surgery can affect the patient's condition by altering previous outcomes. Thus, orbital decompression can change the oculomotor condition; oculomotor surgery can change the position of the eyelid.

Since some forms have a visual prognosis that includes compressive neuropathies, corneal exposure due to major exophthalmos may require emergency surgery.

Except for these cases, patients with stabilised orbitopathy are operated on only after being euthyroid for more than six months.



4.2. DIFFERENT ASPECTS

PROPTOSIS

- Bilateral
 - Symmetric
 - Asymmetric
- Unilateral
- Inflammatory or not
- Mild to severe
- Isolated or associated with lid malpositions or strabismus

LID MALPOSITIONS

- Upper lid retraction +++
- Lower lid retraction
- Ptosis
- Entropion

MYOPATHY

- Diplopia
- Restriction of eye movement

Some examples



Major and symmetric proptosis



Unilateral proptosis with true upper eyelid retraction



Unilateral proptosis-upper eyelid retraction-orbital fat with bags-hypotropia



Proptosis with inflammation

*Exophthalmos with Ptosis
Ophthalmoplegia (Myopathy)*



Proptosis with inferior Lymphedema

Lymphedema With Hypothyroidism

4.3. EVALUATION

Dysthyroid orbitopathy evaluation

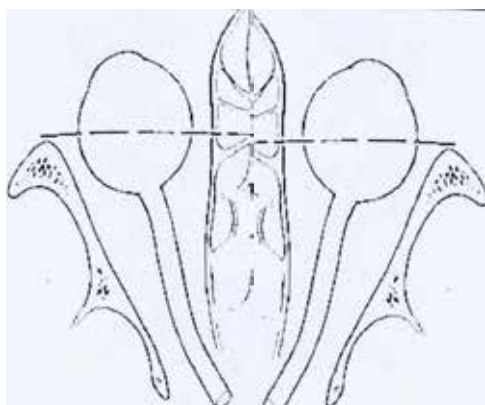
- T3, T4, TSH
- TSH receptor antibodies
- CT scan and MRI: muscles, fat, optic nerve, sinus
- Visual field
- Hess screen

4.4. IMAGING

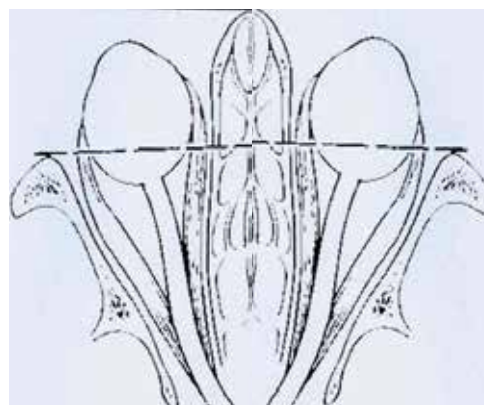
Orbital imaging

- Degree of exophthalmos → Grade I, II, III
 - Muscular, fat or mixed form
 - Optic nerve compression
 - Muscle inflammation
 - Evaluation of orbital bones and size of sinus (for orbital decompression choice)

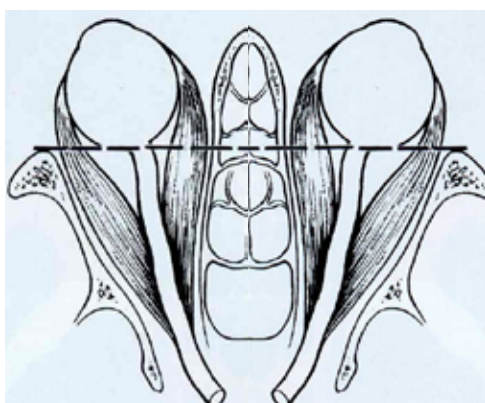
Degree of exophthalmos



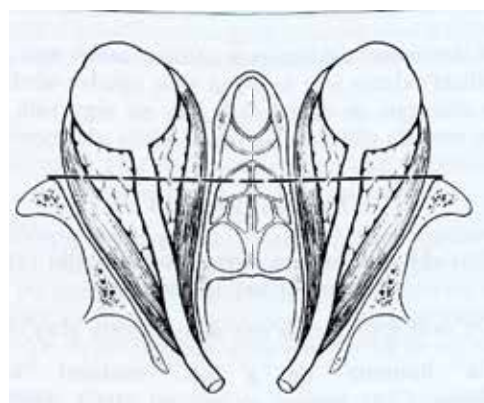
Normal situation*



Grade I*

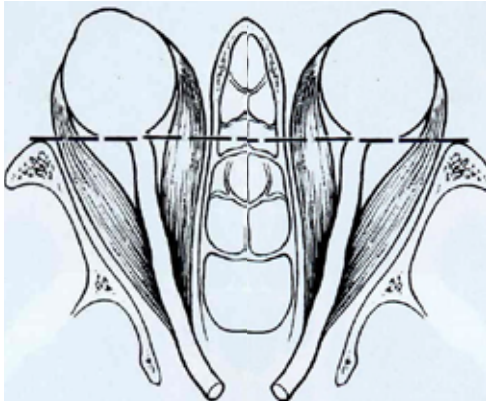


Grade II*

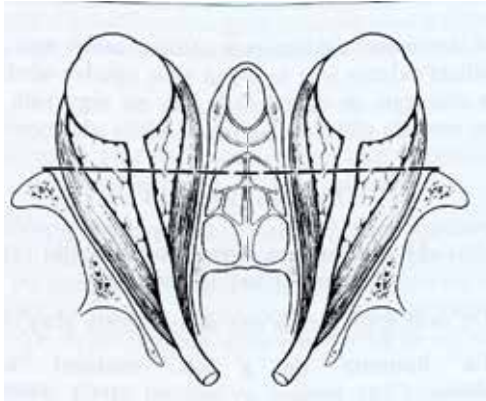
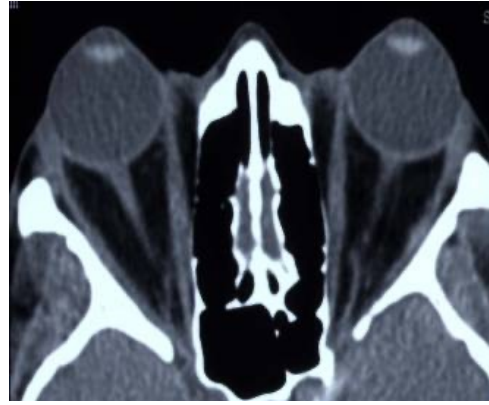


Grade III*

* [Ref: personal]



*Moderate exophthalmos, Grade 2**



*Major exophthalmos, Grade 3**



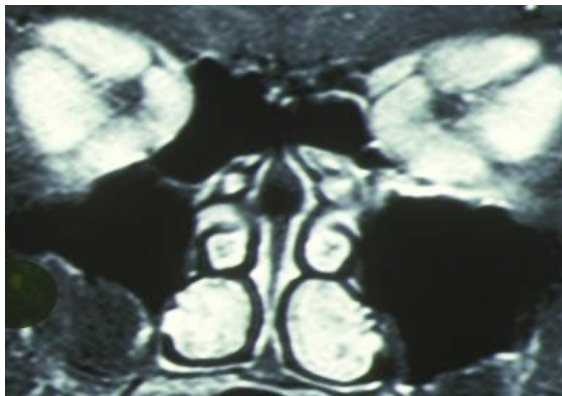
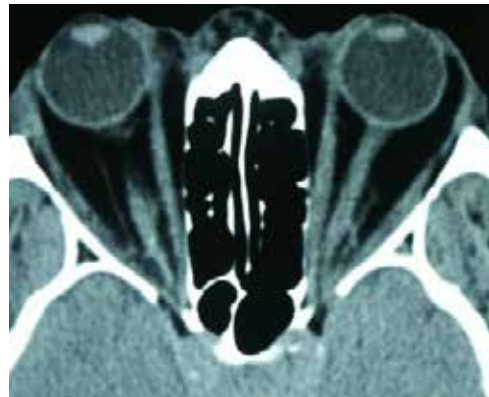
* [Ref: personal]

Imaging

- Degree and nature of myopathy
- Fat involvement



Fat involvement with thin stretched muscles



Severe myopathy with apical crowding



04 SURGERY OF DYSTHYROID ORBITOPATHY

Imaging

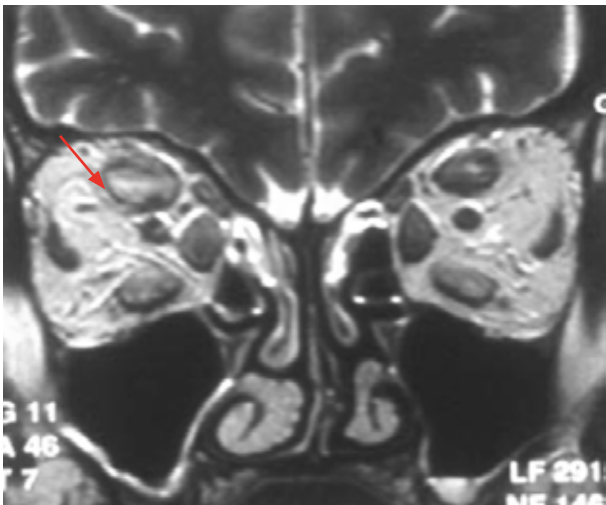
What to SEARCH and to FIND before the choice of DECOMPRESSION



CT SCAN: size of the bones



CT SCAN: size of the sinus

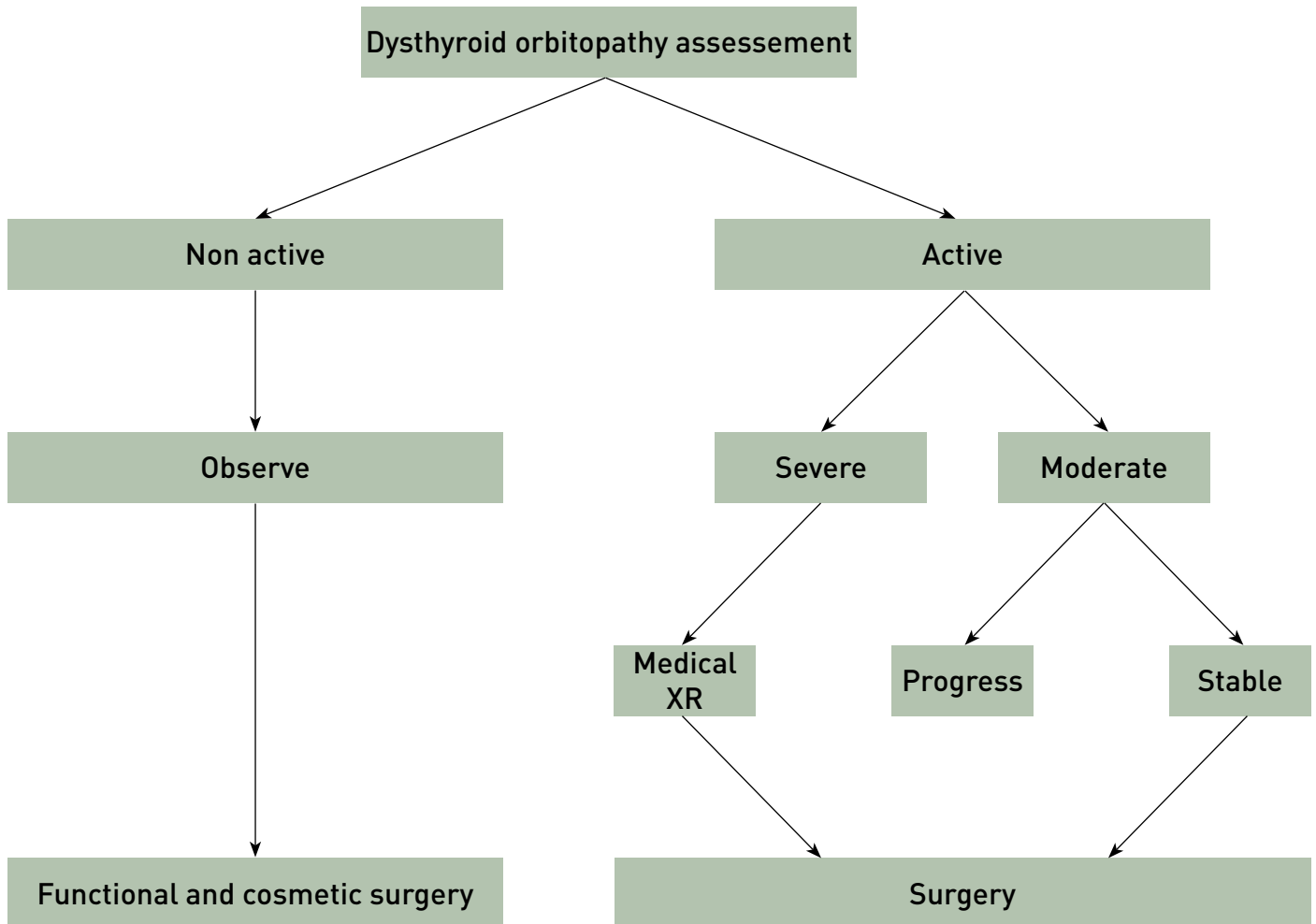


MRI: Muscle INFLAMMATION and optic nerve compression



CT SCAN: APEX-optic nerve compression by volume muscle increased

4.5. MANAGEMENT



4.6. SURGICAL TREATMENT

- | | |
|---|---|
| <p>1) Decompression:</p> <ul style="list-style-type: none"> • Bone decompression • Fat decompression/resection • Optic nerve decompression | <p>2) Squint surgery</p> <p>3) Eyelid surgery</p> |
|---|---|

4.6.1. DECOMPRESSION

Bone decompression

The indications are based on the severity of exophthalmos, its fat, muscular, or mixed nature, the condition of the orbital bone walls, and the size of the sinuses (clearly visible on imaging).

The objectives are to enlarge the orbital cavity and thereby reduce exophthalmos and decrease the pressure on the eyeball.

Ocular motility may improve or worsen due to decompensation of a preexisting oculomotor disorder.

The surgical approaches (see chapter on orbital surgery) include:

- The conjunctival route combined with external cantholysis
- The superior eyelid crease approach extended toward the lateral canthus, allowing access to both the external and internal orbital walls
- The coronal approach through the scalp, which has the advantage of leaving no visible scar and allows access to three bone walls

The number of decompressed walls is 2 for moderate exophthalmos (grades 1 and 2), and 3 walls for grade 3 exophthalmos.

Results are better when the exophthalmos is moderate, the muscles are not very fibrous, and there is abundant fat.

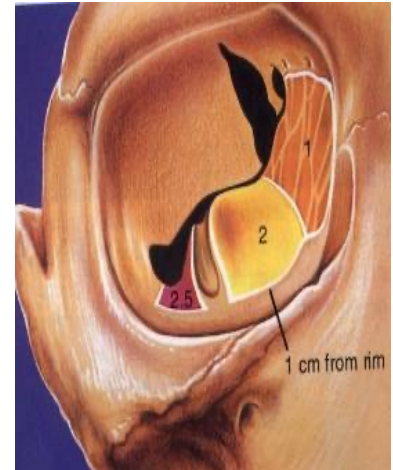
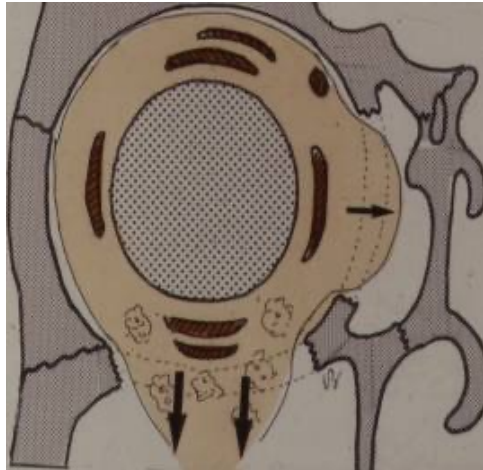
Fat decompression excision/resection

It involves removing extraconal and intraconal fat, using the same surgical approaches as bone decompression. Surgical indication is reserved only for fatty forms of exophthalmos (clearly visible on imaging). To be effective, the volume of fat to be removed must be at least 6 cm³. This procedure reduces the orbital content. As a general rule, fat decompression is performed simultaneously with bone decompression, since most cases of exophthalmos are mixed.

Optic nerve decompression

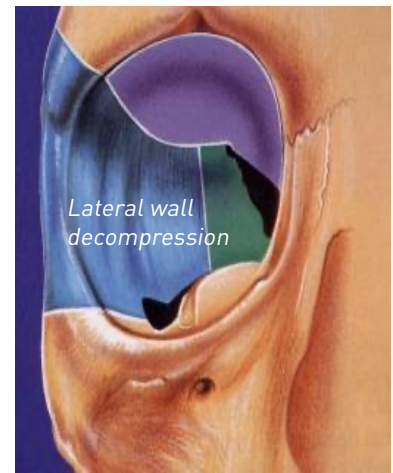
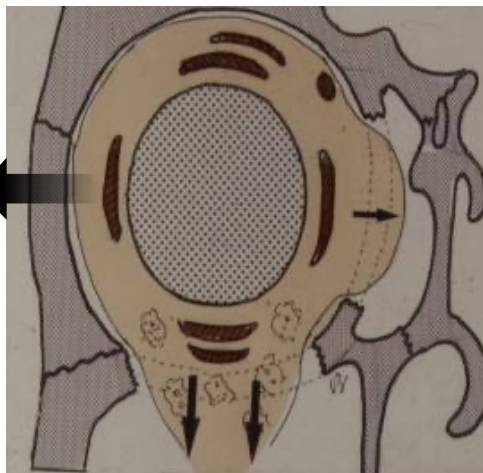
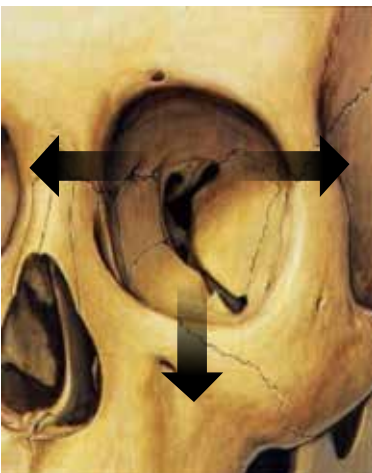
Compressive optic neuropathy constitutes a therapeutic emergency. In cases where high-dose corticosteroid therapy fails, orbital decompression may be indicated. This type of decompression is typically very posterior, as the compression is located at the orbital apex and is associated with large fibrotic extraocular muscles. Exophthalmos is often minimal or not apparent, as the bulky fibrotic muscles tend to pull the globe backward. An endonasal endoscopic approach can be used to access the posterior part of the orbit. Visual function improvement is often rapid and dramatic.

Two-wall decompression (medial and floor walls)



*

Three-wall decompression



*

*From Rootman J. *Orbital Surgery. A conceptual approach*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2014

04 SURGERY OF DYSTHYROID ORBITOPATHY

Conjunctival approach with cantholysis for one-wall or two-wall decompression



Cantholysis



Conjunctival approach



Fat resection

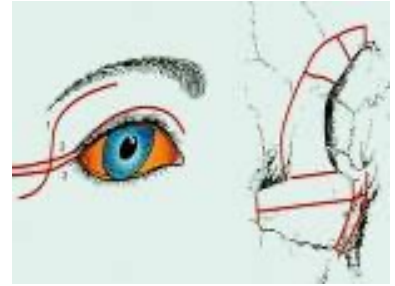


Exposition of the floor before decompression



Reposition of the eyelid

Upper eyelid crease incision for two-wall or three-wall decompression



Skin approach



Lateral orbital rim exposition

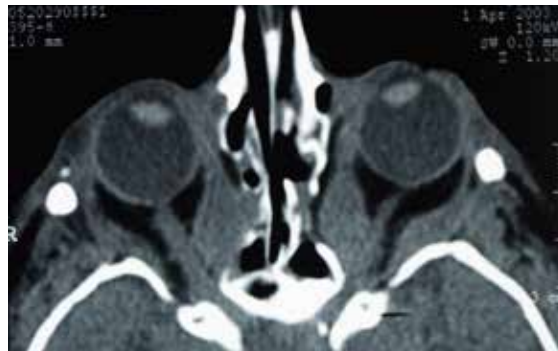


Osteotomy preparation



After lateral orbital wall decompression

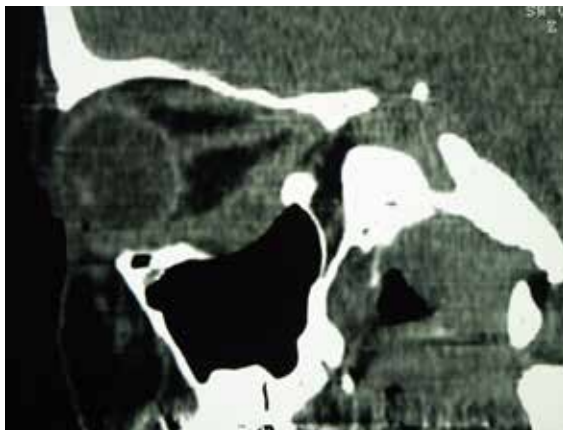
Control CT SCAN after three-wall decompression for exophthalmos and optic nerve compression by a large medial rectus muscle



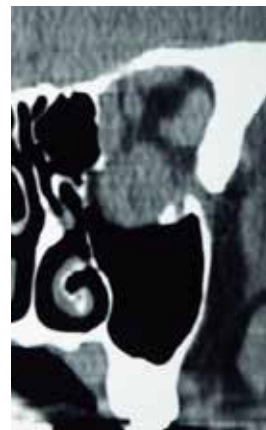
Axial CTS

Medial wall decompression near the apex

*Sagittal CTS
Floor wall
decompression*



*Coronal CTS
Floor
decompression
with large inferior
rectus muscle in
the sinus*



04 SURGERY OF DYSTHYROID ORBITOPATHY

Fat decompression and excision



Imaging: Increase of the fat



Fat volume resection::> 6cm³



Surgical view after left fat decompression in comparison with the right size



Result of a left fat decompression with reduction of the bags



The approach



Inferior eyelid dissection



Resection of the lateral fat compartment



Important volume of the fat resection



4.6.2. SQUINT SURGERY

Dysthyroid orbitopathy-related oculomotor disorders are common and range between the isolated form of hypotropia with limitation of elevation and multisymptomatic forms associated with exophthalmos and/or eyelid retraction.

Sometimes the oculomotor disorder can be caused or worsened by orbital decompression.

Muscle damage is related to restrictive myopathy, which should be treated with muscle recession, depending on the extent of the deviation, or adjustable surgery, with the goal of suppressing double vision in the primary and reading positions.

Surgery is performed after possible decompression and before eyelid surgery (after six months of thyroid and orbital stability).



Moderate form: right hypotropia, moderate exophthalmos and upper eyelid retraction



Complex form with hypotropia, no left eye elevation, exophthalmos, eyelid retraction

Clinical examination of a patient with myopathy in dysthyroid orbitopathy

- Exophthalmos
- Vertical deviation
- Upper eyelid retraction



*Primary position: exophthalmos
Hypotropia, scleral show*



Downgaze: lid lag due to true upper eyelid retraction



Right eye fixation



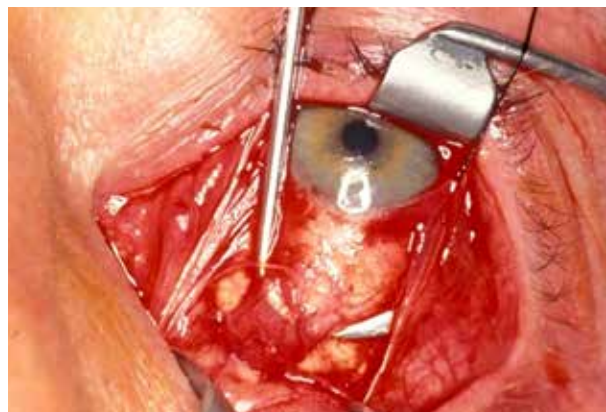
Very poor elevation due to inferior rectus fibrosis

04 SURGERY OF DYSTHYROID ORBITOPATHY

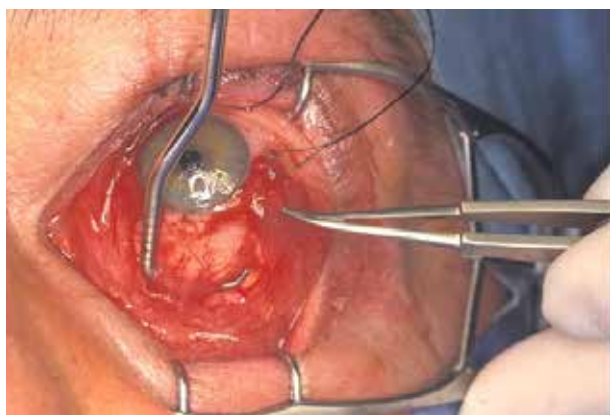
Surgical approach

- Right orbital decompression
- Squint surgery: right inferior rectus recession
- Palpebral surgery: right levator recession

Intraoperative aspect of the inferior rectus fibrosis



Surgical approach to fibrotic Muscles



Inferior rectus fibrosis



Traction test in upgaze



Inferior rectus recession with loops



CASE REPORTS

Simple squint surgery



Hypotropia – fibrosis of the inferior rectus



Limitation of upgaze



Result after inferior rectus recession



Esotropia by medial left rectus muscle



Result after left rectus muscle recession

Complex squint surgery in 3 procedures

1. Orbital decompression - 2. Squint surgery - 3. Eyelid surgery



Severe left proptosis –hypotropia-eyelid retraction



TDM:increased inferior and medial rectus volume



After two-wall decompression and squint surgery



Final result after lengthening of the levator

4.6.3. EYELID SURGERY

The surgical procedures are described in the chapter on Eyelid Muscle Retractions (1.5.) and in the chapter on Blepharoplasty (2.1.)

- Eyelid surgery is the final step in the aesthetic rehabilitation of thyroid eye disease (TED).
- It follows orbital decompression and, if needed, extraocular muscle surgery.
- It is indeed impossible to objectively assess the severity of eyelid abnormalities as long as exophthalmos and oculomotor disorders remain untreated.
- Thus, in cases of significant, untreated unilateral exophthalmos, eyelid surgery alone will not yield a satisfactory outcome.
- The main indications are upper eyelid retraction, followed by lower eyelid retraction, and cosmetic corrections (such as dermatochalasis and lower eyelid fat prolapse).
- In the upper eyelid, mild or spasmodic retraction (about 2 mm) can benefit from a posterior approach mullerectomy.
- In cases of severe retraction due to muscle fibrosis, levator lengthening procedures are used, with or without biomaterial or tissue graft interposition between the upper tarsal border and the levator muscle.
- The lengthening should be twice the amount of retraction (e.g. 6 mm lengthening for 3 mm of retraction).
- The correction is best assessed under local anesthesia.
- Blepharoplasty is often performed at the same time.
- In cases of significant lower eyelid retraction, it is essential to place a spacer graft between the tarsus and the detached lower eyelid retractor.
- Common materials used include biomaterials or autografts (e.g. cartilage, dermis, palatal mucosal grafts, etc.).
- Fat prolapse (lipoptosis) is corrected during the same procedure.
- Myxedema can be treated by direct excision.

EYELID MALPOSITIONS IN GRAVES' DISEASE

Clinical features

- Upper eyelid retraction
- Lower eyelid retraction
- Ptosis



Upper eyelid retraction



Lid lag in downgaze

- Dermatochalasis
- Fat prolapse
- Eyelid infiltration



Upper eyelid retraction with fat prolapse

Clinical evaluation

- Evaluation of the degree of lid retraction (margin reflex distance MRD or scleral show)
- Levator function
- Eyelid closure
- Exophthalmometry

Upper eyelid retraction

One of the most frequent features of Dysthyroid Orbitopathy.

Different aspects can be described:

- The permanent retraction with lid lag in downgaze by levator fibrosis
- The spasmodic retraction by Müller overactivity
- False retractions due to exophthalmos or/and hypotropia which change the position of the upper eyelid

This is why eyelid surgery must be done in complex cases at the end after orbital surgery and squint surgery



*Left upper eyelid retraction with contralateral ptosis.
Orthophoria in primary position and no exophthalmos*



Lid lag in downgaze

4.7. CASE REPORTS AND RESULTS

One surgical procedure:
Orbital decompression for simple proptosis



Major bilateral and symmetric proptosis with false eyelid retraction



Result after three-wall decompression by coronal approach. No surgery on the eyelids.



Unilateral two-wall (medial-lateral) decompression



Two Surgical procedures:
1. Orbital decompression for proptosis
2. Eyelid surgery for eyelid retraction



Major exophthalmos with eyelid retraction



Three-wall orbital decompression by coronal approach (procedure 1)



Result at 3 months. Asymetry by mild right upper eyelid retraction



Final result after right müllerectomy (procedure 2)

Two Surgical procedures:

1 - Two-wall orbital decompression

2 - Upper eyelid lengthening

For Severe unilateral proptosis with upper eyelid retraction



Major exophthalmos – eyelid retraction



Result after two procedures



Lid lag in downgaze = true retraction increased by the proptosis



Result

Two surgical procedures:

Bilateral two-wall orbital decompression with simultaneous eyelid elevation using a hard palate graft

For exophthalmos with inferior eyelid with scleral show



Major proptosis with major inferior eyelid retraction



Result



The importance of the inferior scleral show



Result after two simultaneous procedures

04 SURGERY OF DYSTHYROID ORBITOPATHY

Bilateral bone and fat decompression with simultaneous lower eyelid elevation

For exophthalmos with scleral show



*Proptosis – inferior eyelid retraction
Excess of fat*



Two-wall decompression – lower lid elevation – fat resection. Final result after 2 simultaneous procedures

Two surgical procedures:

1. Bilateral bone and fat decompression
 2. Upper eyelid lengthening and blepharoplasty
- For exophthalmos, bags and upper eyelid retraction



Before



After



Three surgical procedures:

1. Orbital decompression

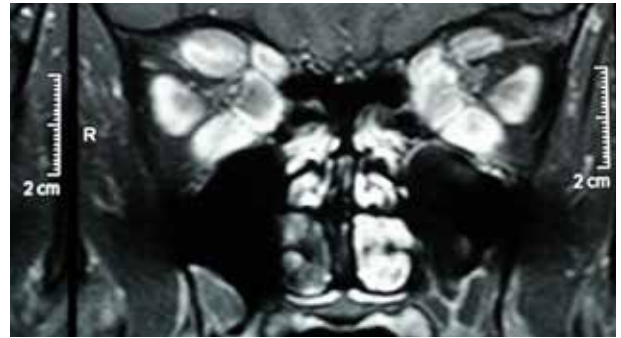
2. Squint surgery

3. Eyelid surgery

For exophthalmos esotropia and eyelid retraction



Proptosis – esotropia – eyelid retraction



MRI: muscle fibrosis and volume increase



After decompression and squint surgery



Final result after lengthening the levator

04 SURGERY OF DYSTHYROID ORBITOPATHY

Complex case with the association of 3 surgical procedures:

- 1. Bilateral orbital decompression**
- 2. Recession of the inferior rectus muscle**
- 3. Eyelid lengthening**

For proptosis, strabismus and eyelid retraction



*Proptosis – strabismus –
eyelid retraction*



Lid lag in downgaze



*No elevation by fibrosis of the inferior
rectus muscles - no occlusion by
fibrosis of the levators*



*Result after three procedures: reduction of proptosis – orthophoria in primary position –
no lid lag and complete occlusion*



[illegible]

NOTES

[illegible]



Edition

Edited by:
Laboratoires Théa
12 rue Louis Blériot
63000 Clermont-Ferrand
Tel.: +33 4 73 98 14 36

Not for sale.

Collection Librairie Médicale Théa



12 Rue Louis-Blériot - ZI du Brézet
63017 Clermont-Ferrand cedex 2 - France
Tel. +33 (0)4 73 98 14 36 - Fax +33 (0)4 73 98 14 38
thea.com