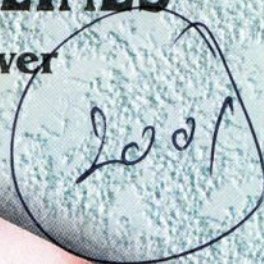


CME SERIES (No. 5)

OCULOPLASTIC SURGERY

PRACTICAL GUIDELINES

Editor : Dr. A.K. Grover



ALL INDIA OPHTHALMOLOGICAL SOCIETY

Published by :

ALL INDIA OPHTHALMOLOGICAL SOCIETY

Dr. Rajendra Prasad Centre for Ophthalmic Sciences,
All India Institute of Medical Sciences,
Ansari Nagar, New Delhi - 110 029

(as a part of the CME Programme)

**THIS CME MATERIAL HAS BEEN SUPPORTED BY THE FUNDS OF
THE AIOS, BUT THE VIEWS EXPRESSED THEREIN DO NOT
REFLECT THE OFFICIAL OPINION OF THE AIOS.**

For any suggestions, please write to :

Dr. H.K. Tewari
Hony. General Secretary

CME SERIES (No. 5)

OCULOPLASTIC SURGERY

PRACTICAL GUIDELINES

Editor : Dr. A.K. Grover



ALL INDIA OPHTHALMOLOGICAL SOCIETY

Preface

Oculoplastic Surgery has evolved rapidly over the past few decades resulting in extremely gratifying functional and cosmetic results in patients with eyelid disorders. Before these strides patients were often doomed to persistent discomfort and disfigurement or even visual loss. Oculoplastics as a speciality in India, has come of age during the past decade or so. There is an immense interest in the speciality in the country now as evidenced by the overflowing halls at the sessions on Oculoplastics at the National conferences.

The idea of CME publications mooted by the Academic and Research Committee received a practical shape by the efforts of our dynamic secretary, Prof H.K. Tewari. These publications have received an extremely encouraging response. This CME on Oculoplastics is an endeavour to provide practical guidelines for management of eyelid conditions seen in day to day practice by the members of the society. I am sure this manual will fuel the growing interest in the subject and fulfill the member's requirements of guidance in eyelid surgery.

This manual includes introduction to practical eyelid anatomy and physiology; guidelines for management of the commonly faced problems of entropion, ectropion, congenital ptosis and eyelid trauma.

I am grateful to the eminent Oculoplastic surgeons of the country who have given their time and effort to write these chapters.

I must acknowledge my debt of gratitude to Prof. Y. Dayal who as doyen of oculoplastic surgery in the country of initiated me into this speciality.

Contributors

1. **Air Marshal M.S. Boparai, M.S.**
*Consultant Oculoplastic and Eye Surgeon
Defence Colony, Gurgaon*
2. **G. Chandra Sekhar, M.D.**
*Chief, Oculoplastic Services
L.V. Prasad Eye Institute, Hyderabad*
3. **A. K. Grover, M.D., M.N.A.M.S.**
*Chairman, Department of Ophthalmology,
Sir Ganga Ram Hospital
and Director "Vision" The Eye Clinic, New Delhi*
4. **V.P. Gupta, M.D., D.N.B.**
*Chief, Oculoplastic Services
Professor & Head
Department of Ophthalmology
University College of Medical Sciences and
GTB Hospital, Delhi*
5. **Saurabh Jain, M.S.**
*Maulana Azad Medical College and
Guru Nanak Eye Centre, New Delhi*
6. **Simaljeet Kaur, M.S.**
*Senior Resident
'Vision', The Eye Clinic, New Delhi*
7. **Major S.S. Mann, M.S.**
Military Hospital, Jodhpur
8. **Anju Rastogi, M.S.**
*Associate Professor,
Maulana Azad Medical College and
Guru Nanak Eye Centre, New Delhi*
9. **Nirmala Subramanian, M.S., M.Ch. (Plastic Surgery)**
*Chief, Oculoplastic Services
Medical Research Foundation and
Shankar Nethralaya, Chennai*
10. **Y. Sujatha, M.D.**
*Consultant Ophthalmologist,
Orbit - Oculoplastic specialist
Dr. Shroff's Charity Eye Hospital, New Delhi*

Contents

S. No.	Topic	Page No.
1.	Anatomy and Physiology of Eyelids <i>Dr. Y. Sujatha</i>	7
2.	Principles of Oculoplastic Surgery <i>Dr. A.K. Grover and Dr. Simaljeet Kaur</i>	11
3.	Principles of Management of Eye Lid Trauma <i>Dr. (Air Marshal) M.S. Boparai and Dr. (Major) S S. Mann</i>	15
4.	Principles of Management of Cicatricial Entropion <i>Dr. Anju Rastogi and Dr. Saurabh Jain</i>	22
5.	Guidelines for Management of Involutional Entropion <i>Dr. G. Chandra Sekhar</i>	32
6.	Management of Cicatricial Ectropion <i>Dr. Nirmala Subramanian</i>	37
7.	Involutional Ectropion <i>Dr. V.P. Gupta</i>	42
8.	Congenital Ptosis - Evaluation and Management <i>Dr. A.K. Grover</i>	53
9.	Basic Principles of Eyelid Reconstruction <i>Dr. V.P. Gupta</i>	77

ANATOMY AND PHYSIOLOGY OF EYELIDS

DR. Y. SUJATHA

A clear understanding of the functional surgical anatomy of eyelids is very important in the management of various lid disorders. The eyelids are complex structures designed to protect the globe from a variety of traumatic conditions. Eyelids contain an external epithelial surface for protection and an internal mucosal surface for lubrication of eyeball.

The three basic compartments of eyelids are the anterior lamella, the posterior lamella and the middle lamella^{1,2,3}. The anterior lamella includes skin and orbicularis muscle, the posterior lamella contains conjunctiva, while the middle lamella is composed of lid retractors. The functional significance of these three layers is that an excessive tightening of any of these lamellae can lead to anatomical defects, for example ectropion can result from anterior lamellar tightening, entropion can result from posterior lamellar tightening while lid retraction occurs with middle lamellar tightening.

Upper Eye lid Anatomy & Physiology

The layers of upperlid from anterior to posterior are : skin, subcutaneous tissue, orbicularis muscle which is sub-divided into preseptal & pretarsal portions, orbital septum, preaponeurotic pad of fat, levator aponeurosis with its various attachments, Muller's muscle, tarsal plate, and conjunctiva. (Fig. 1) The main retractor muscle of upperlid, the **levator palpebrae superioris** enters the lid, just anterior to the insertion of superior rectus. A small **suspensory ligament** of upper fornix is seen extending from the inferior surface of levator muscle. The tendinous portion of levator muscle is called **levator aponeurosis** travels forwards and skin inferiorly getting inserted along the anterior tarsus in its upper two thirds of tarsal plate. Other attachments of levator aponeurosis are to orbicularis muscle and skin via subcutaneous tissues, which are important in forming the normal lid crease.

Normal upperlid is capable of 13 to 16 mm excursion from its extreme downgaze to far upgaze. Other anatomical factors helpful in this free motility are thin upperlid skin and paucity of subcutaneous tissues. **Orbicularis muscle** acts like a sphincter of eyelids and is responsible for blinking and forcible lid closure. The structure that is mainly responsible for the lid stability of eyelid margin is the fibroelastic **tarsal plate**. The non striated muscle, **Muller's muscle**, arises near the junction of levator muscle and its aponeurosis on the posterior surface, and attaches to the

superior border of tarsus. The functional significance of Muller's muscle is not very clearly defined but it is thought to contribute to the normal eyelid height and contour.

The **superior transverse ligament (Whitnall's ligament)** arises from the periorbita near the trochlea and fuses centrally with the levator muscle sheath. It assists in suspension of both the levator muscle and the lacrimal gland. The **orbital septum** is a fascial structure extending between periosteum of superior orbital rim and the levator aponeurosis at the lid crease. The functional significance of orbital septum is formation of anterior boundary of the preaponeurotic space a barrier between eyelid and orbit. The medial and lateral **orbital fat pads** function like bursa helping the free mobility of levator muscle.

The lateral extensions of levator aponeurosis are called **levator horns**, which get inserted into the medial and lateral orbital rims along with canthal tendons. The lateral horn divides the lacrimal gland into orbital and palpebral lobes. The levator horns also function like **check ligaments**, limiting the superior excursion of muscle. The **palpebral conjunctiva** is continuous with the **bulbar conjunctiva** via **superior fornix** and is adherent to the posterior surface of Muller's muscle.

The orbicularis is innervated by seventh cranial nerve while levator muscle is innervated by superior division of third cranial nerve. Muller's muscle is a smooth muscle innervated by sympathetic supply.

The main elevators of upperlid are levator muscle (13 to 16 mm elevation), Muller's muscle (1 to 4 mm elevation), frontalis muscle with its soft tissue connections between the eyebrow and the eyelids (additional 3 mm elevation), and superior rectus muscle with secondary transmitted movement to levator muscle.

Lower Eyelid Anatomy and physiology

The layers of lowerlid from anterior to posterior are – skin, pretarsal

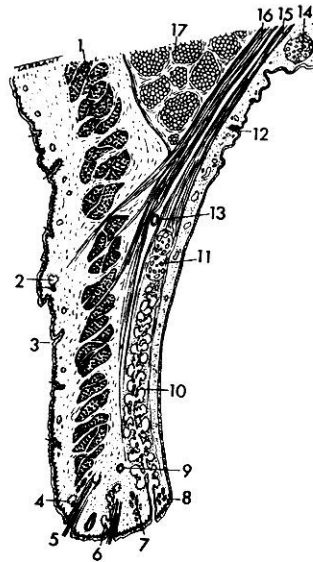


Fig. 1: 1.Orbicularis muscle. 2. Sweat gland. 3. Hair follicle. 4. Gland of Zeis. 5. Cilium. 6. Gland of Moll. 7. marginal part of Orbicularis. 8. Sub tarsal part of Orbicularis. 9. Arterial arcade. 10. Meibomian gland. 11. Gland of Wolfring. 12. Conjunctival crypts. 13. Superior arterial arcade. 14. Gland of krause. 15. Muller's muscle. 16. Levator palpebrae superioris. 17. Orbital fat.

orbicularis, tarsal plate, palpebral conjunctiva.(Fig. 2) Below the level of tarsal plate the layers are : skin, preseptal orbicularis, orbital septum, inferior tarsal muscle, capsulopalpebral fascia, orbital fat pad, and inferior



Fig. 2

rectus muscle. The **retractors of lower lid** originate from antero – inferior surface of inferior rectus muscle after encompassing the inferior oblique muscle and finally get inserted into the inferior fornix via **suspensory Lockwood's ligament**. The **capsulo palpebral fascia** is functionally a structure that is equivalent to the upper lid levator aponeurosis. The **inferior tarsal muscle** is analogous to the Muller's muscle/and together with capsulo palpebral fascia helps in the retraction of the lower lid.

Fig.3 gives the anatomy of the upper and lower eyelid in relation to the eyeball.

Eyelid Margin

Margin of eyelid exhibits a central greyline, the muco cutaneous junction which divides the lid margin into an anterior ciliated epithelial surface and a posterior mucocutaneous layer with meibomian gland orifices. There are about 30 modified sebaceous glands, also called **meibomian glands** in each tarsus. The modified sebaceous glands which are associated

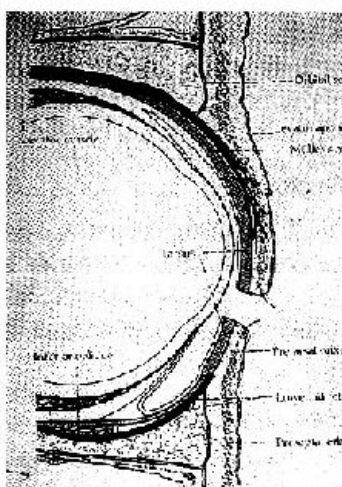


Fig 3

with eyelash follicles, are called **Zeis glands** which are placed anterior to the greyline. These glands lubricate the lid margin, prevent overflow of tears, and form the outer lipid layer of pre-corneal tear film which prevents evaporation of tears. The modified sweat glands, known as **glands of Moll** are also placed anterior to greyline, in between the eyelashes. The common stye or **Hordeolum externum** is an acute infection of a lash follicle with its associated glands of Zeis or Moll, while **Hordeolum**

internum is an acute infection of meibomian glands. The chronic lipogranulomatous inflammation of meibomian glands, due to obstruction of its duct, is called **chalazion**. Following chronic inflammation, the meibomian gland orifices may develop abnormal hair follicles which is known as **distichiasis**.

The **cilia**, number more than 100 in the upperlid and 50 in the lowerlid. They are thick, curved away from the eyeball, and have a dense sensory nerve plexus around the hair follicle.

The tarsal borders meeting at the lid margins are nearly straight, while the anti marginal edges curve convexly away. The **tarsal plate** in the upper eyelid measures approximately 10 mm in the center while lower tarsal height is only 5 mm (ranges from 3.2 to 5.00 mm). The disparity between the upper & lower tarsal dimensions is a reflection of the fact that more of the upperlid covers the globe. The tarsal plates are attached medially & laterally to the orbital rims, through '**Canthal ligaments**'. Posteriorly the tarsal plates are lined by tightly adherent conjunctiva, which continues upto the mucocutaneous junction on the lid margin. The laxity of tendons and the tarsus itself can cause distraction of eyelids from the globe, especially in old age and also in patients with habitual rubbing of eyelids. The lax lowerlid can cause epiphora because of tear pump failure. The lateral canthal tendon is most commonly implicated in cases of lowerlid laxity, which can not only result in epiphora but in severe cases may lead to a frank ectropion of lids

Summary

Eyelids represent specialised local adaptations of facial skin and muscles, especially made to protect, moisten and clean the ocular surfaces. This chapter intends to make ophthalmologist familiar with the anatomic concepts as well as the functional significance of the various eyelid structures.

References

1. Smith BC, Delia Rocca RC et al : Ophthalmic Plastic and reconstructive surgery. *Mosby, Toronto*; 1987 (I); 24 - 47.
2. Kanski JJ : Clinical Ophthalmology. A systematic approach 2nd Edition. *Butterworth – Heinemann, London*. 1989; 2-3.
3. Tenzel RR : Orbit and Oculoplastics. Textbook of Ophthalmology. *Podos SM and Yanoff M (eds). Gower, New York*. Vol. 4. 2.1 - 2.4.

PRINCIPLES OF OCULOPLASTIC SURGERY

DR. A.K. GROVER AND DR. SIMALJEET KAUR

Oculoplastic surgery combines 'Science' with 'art'. This marriage of science and art is based on some basic concepts and general principles. These principles determine the quality of surgical results achieved. This chapter brings out those basic concepts and principles which form the backbone of oculoplastic surgery.

The principles of oculoplastic surgery may be discussed under the following heads :

1. Preparation of the patient
2. Incision
3. Closure
4. Haemostasis
5. Skin defects
6. Dressings

1. Preparation of the patient

The patient needs to be prepared both psychologically and physiologically. Psychologically the patient is best prepared with a frank and thorough discussion concerning the medical problem, realistic goals of surgery, alternative approaches and risks.

Physiologically the patient must have all conditions stabilized. This includes treatment or control of diseases like essential hypertension, diabetes mellitus, anemia, vitamin deficiency and chronic cardiac, pulmonary and renal disorders. The medical examination should include physical examination, blood count, urine analysis, prothrombin time, wound culture (if applicable), chest radiograph and electrocardiography.

2. Incision

Wherever possible, incision should be placed in or parallel to skin folds or hair line. These heal with the wound tension and create smaller scars. Laterally a horizontal incision promotes minimal scarring. Medially an incision at 90° to the tendon is best hidden in the natural creases. Incisions are often given along the eyebrow or hairline to conceal the scars.

3. Closure

Wounds should be closed with minimum tension with eversion of skin edges. The tightness of sutures, their placement, types of closure, suture material and needle, all influence wound healing. To achieve eversion suture is inserted close to the open wound margin through the skin, is directed downwards vertically coursing slightly outward to the depth of the wound and is then moved perpendicularly to leave just above the base of wound. It then moves to the opposing tissues is inverted at a corresponding part and emerges from the skin after traversing a symmetrical path. When the suture is tied it causes eversion of wound edges (Fig 1)

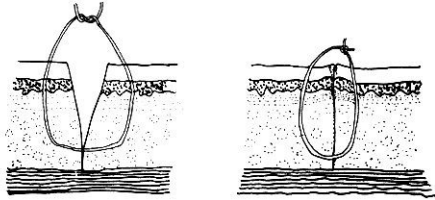


Fig : 1 Interrupted suture - showing the correct path of suture placement through the tissues to cause eversion of wound edges.

4. Suture placement

Sutures should be placed usually in one or more layers of tissue, (between two surgical planes and at the desired depth to form a loop. The various types of sutures are - single continuous suture, interrupted vertical mattress sutures (Fig 2), horizontal mattress (Fig 3), continuous locking (Fig 4), running suture (Fig 5) and subcuticular suture (Fig 6).

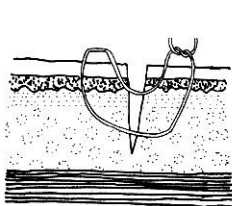


Fig : 2 End-on vertical Mattress Suture. This suture is used to eliminate dead space in a deep wound. It is also used for marginal repair.



Fig : 3 Continuous horizontal mattress suture.



Fig.4 : Continuous locking suture.

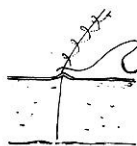


Fig : 5 Continuous non-locking or running suture.

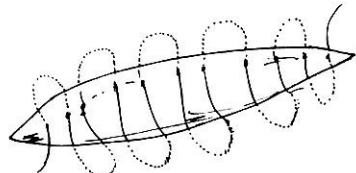


Fig : 6 Subcuticular running suture. When the ends are pulled taut, skin edges are everted and the suture is mostly buried.

5. Haemostasis

In the richly vascularised region of the ocular adnexa and orbit, haemostasis can at times challenge the surgeon. Significant bleeding

may not only obscure the operative fields, but it may detract from the final surgical results and even compromise the patients vision.

Medications that diminish blood clotting like aspirin, Non steroidal anti inflammatory drugs, steroid etc. should be eliminated or reduced, where ever medically possible for 1 to 2 weeks before the operation. Pledgets of cotton or gauze soaked in local anaesthetic with adrenaline one in two lakh units can be used as topical vasoconstrictor to minimize wound oozing. Bleeding points and blood vessels may be closed thermally, electrically or surgically ligated.

6. Skin Defects

Small skin defects with little or no tissue loss can be closed by primary closure. Loss of tissue can be accommodated by advancement, transposition or rotation of adjacent tissues. The two commonly used procedures are Z plasty and V to Y plasty.

Z-Plasty : Z Plasty is a transposition of triangular shaped skin flaps. It serves to lengthen or change the tension on an antecedent scar or wound defect^{2,3,4}

The technique of Z-plasty is as shown in the diagram (Fig 7A-E). If the scar tissue is very long, multiple Z plasties can be prepared to achieve maximal lengthening effect.

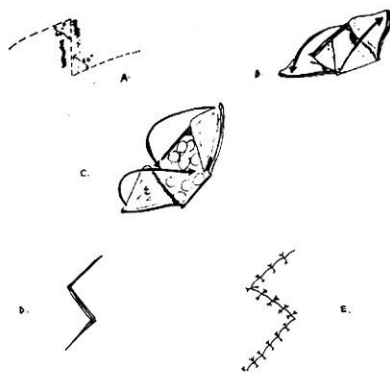


Fig : 7A Central incision through the line of traction with lines offset at 60° angles. B. Flaps dissected free and elevated. C. Fibrotic band excised and flaps are ready for transposition. D. Flaps have been transposed. E. Flaps sutured into position.

V-Y Plasty

AV shaped incision is given on the line of scar with the apex of the V centred in it. The surrounding tissue external to the V is undermined. This results in release of the V in one direction thus lengthening the base of the V. The area is then closed by suturing the former base of the V in a linear fashion with interrupted 6-0 silk. The arms are thus converted into Y. (Fig 8)



Fig.8 : V to Y plasty

Management of Dog Ears when one aspect of the skin wound is longer than the opposite side, primary closure will reveal any redundancy at one or both the ends of the wound. The excessive skin is excised in a

triangular patch so that the skin edges can be properly apposed..(Fig 9)

7. Dressings

Postoperative dressings after oculoplastic surgery are done with the aim to absorb fluids (blood, serum, tears), immobilize tissue, occlude the eye and protect the eye from environmental and self injury in the immediate post operative period.^{5,6} They should be easily removable without causing much of an adherence for which ointment can be applied over the skin. It should restrict ocular function as little as possible and should not injure the globe. Cotton rolls, patches and puffed gauze act as good absorbent providing adequate comfort and are most commonly used.



Fig.9 : Correction of the dog-ear. The redundant skin edges are stretched and excised along the line of incision.

References

1. Smith BC. Ophthalmic Plastic and Reconstructive Surgery, Vol. I. The C V Mosby Company. St Luis, Washington D.C. Toronto, 1987.
2. Borges AF and Alexender JE, Relaxed skin tension lines, Z-plasties on scars and fusiform excision of Lesions. Br J Plastic Surgery, 15 : 242; 1962.
3. Borges AF and Gibson T. The original Z Plasty. Br J Plastic Surgery. 16 : 379; 1963.
4. Mc Gregor VA. Fundamental techniques of Plastic Surgery (ed 6). Churchill Livigstone Inc. Edinburgh, 1975.
5. Gibson EN and Poate WJ. The use of adhesive Surgical tape in plastic Surgery. Br J Plastic Surgery. 17 : 265; 1964.
6. Weismann PA. Microporous Surgical tape in wound closure and Skin grafting. Br J Plastic Surgery. 16 : 379; 1963.

PRINCIPLES OF MANAGEMENT OF EYE LID TRAUMA

DR. (Air Marshal) M.S. BOPARAI and DR. (Major) S.S. MANN

Introduction

Eye lid injuries are on the rise primarily because of increasing incidence of road traffic accidents, industrial mishaps and intentional assaults on human body. Scattered windscreen glass pieces and flying debris are the causes of lid lacerations. In such a scenario more and more ophthalmologists are being called upon to tackle these cases. It therefore becomes important for all ophthalmologists to have a basic understanding of lid repair based on sound oculoplastic principles. Not only should the eye surgeon be able to achieve good anatomical repair but should also demonstrate an artistic quality so that the shape and lines of the features on both sides of the face remain comparable and physiological function does not suffer.

Surgical anatomy of the eyelids

It is intended to discuss only selected features of particular importance in surgical repair. The lids should be considered as triple layer structures. The anterior layer is composed of skin, the middle layer is composed of orbicularis muscle and the posterior layer is composed of the tarsus and palpebral conjunctiva. Each of the three layers should be closed separately in all lid lacerations that transect the tarsus.

Vascular supply to the lid is very rich and primary repair upto 24 hours is possible. Conservatism is the rule in debridement. Even badly macerated tissues on first examination may heal very well.

The skin of the lid is thinnest in the body and is very elastic having no subcutaneous fat and is almost hairless. It can therefore be mobilised extensively, is ideal for full thickness and transpositional flaps and marked accumulation of fluid takes place following any form of trauma, accidental or surgical.

The primary function of the upper lid is protection of the globe, while that of the lower lid is drainage of tears. In lacerations of the lower lid looking for and repair of cut canaliculus is important.

Basic Considerations in Repair

- A. Assessment of injury
- B. Anaesthesia

- C. Protection of globe
- D. Suture material and suturing
- E. Wound hygiene, antibiotics and tetanus immunisation

(A) Assessment of Injury

- (a) A good examination should be carried out in good illumination (under general anaesthesia if required) to assess the extent of injury and to rule out any injury to the globe.
- (b) Vision testing and recording is essential from prognostic and medico legal point of view. One may use a handy book or reading material for this purpose if taking the patient to a vision chart is not possible.
- (c) Preoperative photographs if possible will be desirable for future comparison.
- (d) In upper lid, herniation of fat indicates damage to orbital septum and levator Palpabrae Superioris aponeurosis. It is important to identify the LPS and suture the tendon either to tarsus or its distal segment.
- (e) It is important to assess laxity of the lid. In the elderly where the lid is lax, even a lid coloboma a half the eyelid width may be repaired by primary suturing which may not be possible in the young.
- (f) Assess the medial and lateral canthus to rule out injury to the canthal tendons. Injury to the medial canthus as well often results in injury to the lacrimal canaliculi.
- (g) Spend time in untangling the rolled up tissues and laying them in proper planes lest undue debridement is done.

(B) Anaesthesia

The majority of lid lacerations can be repaired under local and topical anaesthesia if the patient is co-operative. Fig. 1 shows the customary sites of injection for those branches of the fifth and seventh cranial nerves that serve the periorcular tissues. It is desirable to mix both short and long acting anaesthetics with adrenaline. Hyaluronidase offers an added advantage of easy spread and more complete anaesthesia.



Fig 1 : Injection points for facial and orbital anaesthesia and akinesis . (A) Van lnt technique (B) Retrobulbar injection (C) Facial Block (D) Infra orbital block (E) Supra orbital block

Extensive lid injuries should ideally be managed with the patient under general anaesthesia as it allows a thorough examination and gives the surgeon flexibility of time. Even with the patient under GA, the injured area may be infiltrated with 2% Lignocaine with adrenaline to ensure better haemostasis. One should avoid injecting too much, lest the local anatomy gets distorted.

(C) Protection of globe

It is important to remember that abrasions of the corneal epithelium may occur from contact with instruments, sutures or syringes. If unattended there is always the risk of developing corneal ulceration and discomfort to the patient. Protection may be achieved by either lid guards/spatula or scleral contact lens.

(D) Suture material and suturing

Fine suture material is essential to prevent/reduce scarring. 7-0 vicryl/plain catgut for subcutaneous tissues and 6-0/7-0 prolene/mersilene for skin are desirable. The sutures should pass 2 mm on either side of the wound and 3 mm apart. Sutures should be removed after 5-6 days. Sub cuticular suturing has no role in lid repair and interrupted sutures are preferred. While tying sutures one should make an allowance for impending oedema. The wound should be secured without any tension. Wound margins should be handled with due respect and delicate instruments and hooks should be used to minimise trauma. No dead space or raw surface should be left. A skin wound of an eye lid upto 4 mm length in the line of crease requires no suturing.

(E) Wound hygiene

Irrigation is the key to adequate wound cleansing and it should be through an IV set attached to a 500 ml suspended bottle of sterile normal saline. In wounds involving contact with road surface (scraping injuries) all tar pieces or any other foreign bodies must be meticulously removed to prevent pigmentary changes.

Decision to use antibiotics must be based on the extent of the wound and the circumstances of its occurrence. Tetanus toxoid should be given unless a person had a booster toxoid dose taken less than three months prior to the injury.

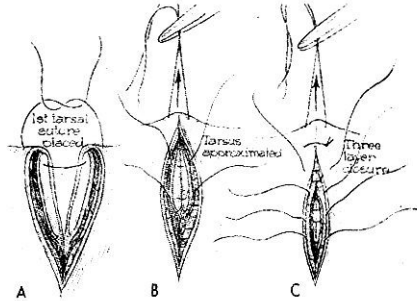
Classification of penetrating lid injuries

- A. Simple lacerations of lids - partial or full thickness
- B. Lid avulsions and lacerations without loss of tissue
- C. Extensive lacerations with loss of tissue

(A) Repair of simple lid laceration

- (a) Debridement
- (b) Control of bleeding
- (c) Search for foreign bodies
- (d) Actual repair of lid laceration

In actual repair of lid laceration of full thickness (Fig. 2A,B,C) the first suturing should be performed at the lid margin, reapposing the grey line with one suture bite and the lash line with a second. These two sutures should not be cut short but instead should be grasped by the assistant with a haemostat thereby maintaining the eyelid in a position of extension during the remainder of the laceration repair.



The tarsoconjunctival layer is closed with interrupted 7-0 absorbable sutures. Knots should be tied on the anterior surface and alternately moved to the nasal and temporal side of the laceration to balance them properly. Suture knots on the anterior surface do not rub on the cornea.

Fig. 2 : Repair of simple lid laceration. (A) The first suture is placed at the lid margin so that the lid can be extended by traction with a haemostat (B) Closure of muscle layer with absorbable sutures (C) Closure of skin with interrupted non-absorbable sutures

The muscle layer is then closed with additional 6-0/7-0 interrupted absorbable sutures and the skin layer is closed with 7-0 prolene, mersilene or silk. A vertical mattress suture may be required in some cases to cause slight eversion of the margins. It starts 2 mm from the laceration margin, exits 2 mm on the fellow side, reverses at 5 mm and exits at 5 mm on the fellow side and tied tight.

If wound edges are ragged they should be trimmed with a sharp blade before repair.

(B) Lid avulsion and lacerations with canalicular injury, without loss of tissue

Glancing blows can avulse a lid which then dangles free like a pedicle flaps. It happens more often at the lateral than the medial end. In avulsion of the lateral canthal tendon, the most important thing is to identify the stump of the canthal tendon and to suture it directly to bone using fine non-absorbable suture material. (synthetic suture or stainless steel wire). (Fig. 3) The tendon is inserted within the orbital margin and not at

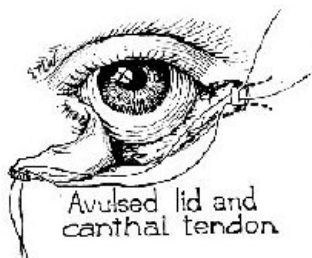


Fig. 3: Traumatic avulsion of medial canthal tendon without injury to canaliculus.

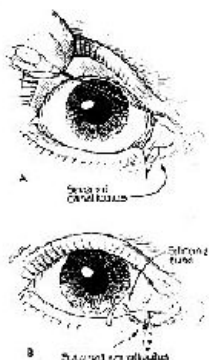


Fig. 4 : Method of identifying severed canaliculus by injection of air and its repair.

the margin lest the lid conformity is disturbed. Some lacerated tendons will unite spontaneously if other lid tissues are restored to their proper positions but primary repair is desirable.

Avulsions of medial canthus necessarily involves damage to the lacrimal canaliculi or sac which should be simultaneously dealt with. The patient should be operated as soon as possible using a microscope. The cut

medial end of canaliculus is identified preferably by intubating the upper canaliculus and injecting air while keeping a thumb pressure on the sac. Bubbles coming out through the saline lake created at the medial canthus help identify the medial end of the canaliculus (Fig 4). The method of injecting dyes makes the tissues messy and therefore is not a method of choice. In experienced hands worst pigtail probe passed through upper punctum, upper canaliculus and manipulated into the sac end of lower canaliculus gives gratifying results in identification of the medial cut end of the lower canaliculus. It further helps in taking a silicon

stent/thread passed from the lower punctum and lateral cut end of the canaliculus through the sac and upper canaliculus to emerge at the upper punctum. This way the two cut ends of the canaliculus are held together for end to end anastomosis using 9-0 nylon. Another way to hold the ends together is to pass a stent through the lower punctum, lateral cut part of canaliculus and engage into the already identified medial cut end of canaliculus and retained there. After end to end anastomosis of the canaliculus sutures are applied to juxta-canalicular tissue. Lid repair is then done in layers. Stent is allowed to remain in place for 12-14 weeks. Thereafter hopefully the patency of the canaliculus will remain maintained and there will be no epiphora.

(C) Extensive laceration with loss of tissue

The first look of such an injury can be startling, where in, one sees a scrambled mass of tissues with areas of exposed eye ball, twisted lid fragments with displaced eye lashes, sections of exposed and everted tarsus, foreign bodies and so on. But once the injured area has been

cleansed and bleeding stopped the pieces can be replaced and put with such surprising completeness, that it is possible to formulate a proper plan of repair.

First requirement is to exclude injury to eyeball and to look for damage to LPS and lacrimal passages. Reconstruction is based on important landmarks like lateral and medial canthal tendons. No tissue should be sacrificed all. The tarso-conjunctival layer is piece meal formed by laborious tissue identification and suturing. Surgeon must exercise great patience and avoid short cuts.

Primary union of lid laceration is possible if one fourth or less of the lid margin is lost. Separate sliding tarsoconjunctival and skin flaps usually can close eye lid defects involving upto one half of the horizontal lid dimension. Only rarely are free skin grafts required. But in case they are required the best site is postauricular area or contralateral upper lid. It is important to remember that a lid needs continuous tarsus at its margin for stability of its contour. Therefore except for 2-3 mm strip of tarsus at the lid margin, all remaining tarsus can be sacrificed or used to fill lid tarsal defects at the lid margin.

It is not possible to discuss further details in a limited text but general principles of three layered repair should be observed.

Rarely sliding tarsal flaps from the opposing eye lid may be required to fill tarsal defects. These are created by splitting of the grey line under magnification to avoid injury to tarsus or vascular orbicularis muscle so that no deformity to lid margin takes place. The use of Z and Y plastes is of great value in repair of extensive lid defects.

In the event of almost complete loss of eyelids, priority attention is required for protection of the globe till specific and extensive plastic surgery for reconstruction of eyelids is undertaken in association with other teams. For short term maintenance of moisture of the eye, a piece of plastic film (Saran wrap) can be sealed over the orbit with ophthalmic ointment at points of skin contact. Without any dissection the conjunctiva can be grabbed at the upper fornix with forceps and a suture passed through it and brought through a similar fold from the lower fornix in the same vertical line. More such interrupted sutures can be put and a double thickness of conjunctiva can be brought over the globe to protect the cornea. These sutures usually last for a few days till the plastic revision of the lids can be planned by sliding flaps, mucous membrane grafts and composite autografts.

Reference

1. Born AJ, Tripathi RC, and Tripathi BJ : Wolff's Anatomy of the Eye and Orbit. *Chapman and Hall, London*, 1997.
2. Stallard HB : Eye Surgery, *John Wright & Sons Ltd.*, 1973.
3. Paton D, Morton F and Goldberg : Management of Ocular injuries. *W.B. Saunders Co.* 1976.
4. Worst JGF : Method for reconstructing torn lacrimal Canaliculus. *Am J Ophthal* 53 pp 520-22, 1962.
5. Smith B, and Charubini, J.D. Oculoplastic Surgery. C V Mosby Co. St Louis 1970.
6. Duke-Elder S and Macfaul PA : System of Ophthalmology Vol XIV, *Injuries C.V. Mosby Co. St. Louis*, 1972.
7. Fox SA : Ophthalmic Plastic Surgery, 2nd Ed. *Grune Stratton, New York* 1958.
8. Mustarde, JC, Jones LT and Callahan A : Ophthalmic Plastic Surgery - up to date, *Aesculapium Publishing Co. Birmingham, Ala* : 1970.

PRINCIPLES OF MANAGEMENT OF CICATRICAL ENTROPION

DR. ANJU RASTOGI AND DR. SAURABH JAIN

Cicatricial entropion with trichiasis can be a challenging problem to manage. The condition is caused by scarring of tarsus and conjunctiva leading to in-turning of the lid margin. It varies widely in its severity and clinical presentation. Any cause of conjunctival scarring can lead to an entropion.

Common Causes of Cicatricial Entropion

1. Trachoma
2. Chemical/Thermal Burns
3. Mucocutaneous disorders.
4. Chronic ulcerative blepharitis
5. Infectious diseases
6. Herpes zoster
7. Lid trauma
8. Lid surgery
9. Chronic anti-glaucoma medications
10. Anophthalmic socket contracture. (Fig 1 and 2.)



Fig. 1 : Post trachomatous cicatricial entropion of both lids.



Fig. 2 : Severe entropion of the upper lid with symblepharon following chemical burns.

A good preoperative history and a thorough examination should be done to elicit the cause and severity of entropion.

Grading

Entropion has been classified by several authors. It may be graded according to the parameters described by **Kemp and Collin**¹:

Mild :

Tarsal plate is normal in position.

Conjunctivalization of the lid margin is present.

Lash / globe contact occurs only when gaze is directed towards the involved eyelid.

Moderate :

Tarsal plate is normal in position.

More significant conjunctivalization of the lid margin is present.

Lash globe contact is present in the primary position.

The term '*lid border entropion*' has been proposed for these cases.

Severe

Gross tarsal deformities are present.

Marked conjunctival scarring is present.

Entropion may also be graded according to the percentage of Meibomian gland openings, which have been displaced posteriorly

Madan Mohan's Classification

Grade I: Rounding of posterior lid margin. Meibomian gland openings are oval and 25-33% of openings are posteriorly displaced.

Grade II: 33-50% of Meibomian gland openings are posteriorly displaced.

Grade III: 50-75% of Meibomian gland openings are posteriorly displaced.

Grade IV: > 75% of Meibomian gland openings are posteriorly displaced with trichiasis.

Non Surgical Treatment

Conventional treatment for trichiasis includes epilation, electrolysis or cryotherapy. These procedures however do not effect a permanent cure and may produce unwanted complications. Moreover they do not correct the basic pathology of entropion.

Cryotherapy is very useful for segmental trichiasis. It should not be done in cases of entropion because it produces eyelid edema, necrosis,

depigmentation, lid notching and complete loss of lashes. Freezing the entire lid may induce further progression of the cicatricial process and may produce multiple posterior metaplastic lashes. It leads to thinning of the tarsus, which reduces the success of any subsequent surgical procedure that may be required.

Surgical Treatment

Numerous surgical procedures have been described to correct cicatricial entropion. No single technique is suitable for all types and grades of entropion. The procedure has to be modified according to the severity and cause of entropion. Mild entropion may be corrected by a simple skin muscle excision. However a severely scarred lid calls for more radical methods with a combination of techniques.

Surgical Procedures for Entropion

1. Skin muscle excision
2. Tarsal paring and wedge resection
3. Tarsal fracture (Tarsotomy with Tarsal rotation).
4. Full thickness blepharotomy and tarsal rotation (Wies technique).
5. Tarsal margin rotation with posterior lamellar super-advancement.
6. Mucous membrane grafting with anterior lamellar repositioning.
7. Posterior lamellar eyelid reconstruction using:
 - Hard palatal mucosa
 - Auricular cartilage
 - Nasal septal cartilage
 - Banked sclera

The various factors, which influence the choice of procedure, are :

1. Severity of entropion
2. Thickness of the tarsal plate.
3. Keratinization of marginal tarsus
4. History of previous entropion surgery.

Certain broad guidelines may be followed while choosing the correct approach. In mild to moderate cases of entropion with an adequate or thickened tarsus, **tarsal wedge resection** or **tarsal fracture** give excellent results. Cases of entropion associated with keratinization of the lid margin need a **tarsal margin rotation with posterior lamellar advancement**. Severe cases of entropion or mismanaged entropion need to be tackled

by anterior lamellar repositioning with a mucous membrane graft or a posterior lamellar graft.

Tarsal Fracture

Tarsotomy with Tarsal Rotation: It is an excellent procedure for mild to moderate cases of entropion with an adequate tarsus. It may also be done in severe cases as a primary procedure after which more complex modalities may be used if needed.

Method: (Fig 3)

The lid is everted over a spatula and a horizontal incision is made parallel to and 3 mm away from the lid margin. The incision is limited to the tarsus and conjunctiva avoiding the underlying orbicularis muscle.

Scarring is released between the anterior and posterior lamellae to allow the eyelid to assume its natural position.

One arm of a double-armed 5-0 silk suture is passed through the proximal cut edge of the tarsus and then passed in the plane between the orbicularis and distal tarso-conjunctiva, to exit through the skin just near the lash line. The other arm is passed in a similar fashion and tied over a rubber peg. (Fig. 4.) 2-3 similar double-armed sutures are passed across the entire lid.

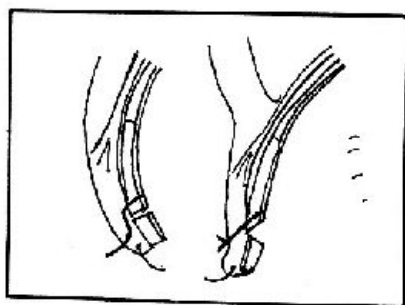


Fig. 3 : Tarsal fracture.



Fig. 4 : Tarsal fracture -Rotation sutures



Fig. 5 : Cicatricial entropion (Pre-op)



Fig. 6 : Post-operative photograph (Tarsal fracture).

Tightening of these sutures rotates the distal mobile fragment outward causing the lashes to evert.

The amount of rotation may be adjusted during the surgery. Mild over correction is the desired end result.

The sutures are removed after 15 days (Fig 5 and 6)

Advantages

Transverse Tarsotomy and lid margin rotation is a simple and effective primary procedure. It repositions the in-turned lid margin without requiring external incision or grafting. The overall success rate for tarsotomy procedure (including repeated tarsotomies) has been reported to be 92.5% by Kersten et al 1992². Complications are few when meticulously performed.

Disadvantages

Over- corrections are very common with this procedure especially in the hands of beginners. This can be avoided by meticulous titration on the table. Lid notching is another common complication which can be prevented by careful spacing and even tension of the sutures. Full thickness lid incision may cause devitalization of the distal lid fragment and should be avoided.

Tarsal Wedge Resection

This is a commonly practiced primary procedure for cicatricial entropion of mild to moderate severity, not associated with lagophthalmos. It works best when the tarsus is thickened.

Method: (Fig 7)

Stay sutures are passed at the lid margin. Skin incision is made at the lid crease.

The distal tarsus is exposed till the roots of the cilia.

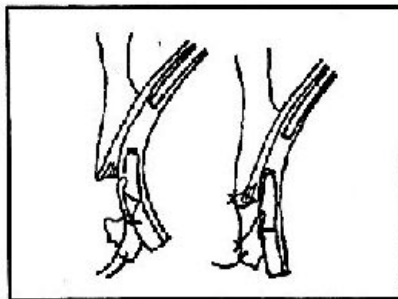


Fig. 7 : Tarsal wedge resection.



Fig. 8 : Tarsal wedge resection- sutures in place.

A wedge of tarsus 3 mm wide and 3mm from the lid margin extending across the entire lid is fashioned. The medial and lateral ends should not be ignored. The wedge is removed, including 90% thickness of the tarsus. Full thickness perforation of the tarsus should be avoided.

The edges of the groove are approximated with 3-4 double-armed sutures of 5-0 silk. After taking bites in the two edges of the wedge, the double-armed suture is passed through the skin and orbicularis just above the lashes. (Fig 8) This closes the tarsal wedge and everts the lashes.

Redundant skin muscle excision may be done to enhance the eversion in more severe cases. The procedure may be combined with lid splitting to increase the correction.

Entropion Clamp : The entire procedure can be done with the help of a lid spatula. An entropion clamp is self-retaining and a good haemostat but suffers from many disadvantages.

It limits the surgical field, making it virtually impossible to include the medial and lateral edges in the wedge, leaving uncorrected entropion in these areas⁴. It distorts the anatomy of the lid making it difficult to assess the amount of correction achieved on the table. It becomes difficult to judge the width of the wedge and the amount of skin muscle excision needed for optimum correction. Unduly excessive pressure on the clamp can cause necrosis of the lid margin. A generalized oozing occurs after release of the clamp which may pose a problem in the post-operative period. For these reasons the use of lid spatula is recommended for Tarsal Wedge Resection.

Advantages : Tarsal wedge resection is a simple primary procedure with hardly any instances of over-correction or lid notching.

Disadvantages : Its effectivity is restricted to mild and moderate cases of entropion, with a thickened tarsus. Meticulous dissection of tarsal wedge of appropriate depth without full thickness perforation requires some expertise and may be time consuming. Moreover under-corrections are more common with this procedure as compared to tarsal fracture.

Tarsal Margin Rotation with Posterior Lamellar Super Advancement

Trabut⁷ described a 180° tarsal margin rotation with a limited posterior lamella advancement. This was modified by Collin⁸ with an advancement of the posterior lamella to the new lid margin. Other authors have advanced the posterior lamella beyond the lid margin and covered the raw tarsal surface with a mucous membrane graft.

This procedure is effective in cases of severe entropion associated with keratinization of the lid margin.

Method : (Fig 9)

The terminal 2-3 mm of the lower tarsus is incised, dissected and rotated outwards 180°.

The posterior lamella is advanced and fixed to the anterior lamella with sutures so that the initial incision becomes the new lid margin.

The everted fragment of tarsus is sutured to the anterior tarsal surface with interrupted sutures.

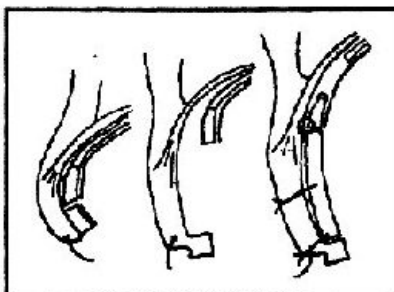


Fig. 9 : Tarsal rotation with posterior lamellar advancement.

Two problems may be associated with this procedure. Inadequate dissection of the levator from the anterior surface of the tarsus produces lid retraction and lagophthalmos⁸. Tarsal buckling may occur while suturing anterior tarsus to the posterior lamella.

TREATMENT OF SEVERE MISMANAGED ENTROPION

Severe cicatricial entropion may occur following trauma, burns, mucocutaneous disorders and trachoma. Mismanaged severe entropion results from several unsuccessful attempts at surgical repair of entropion. These cases are often associated with gross tarsal deformities leading to lid retraction or coloboma. Cases with loss of tarsal plate may be described as 'Window Shade entropion' because the eyelids roll up inside. Severe tarso-conjunctival scarring can cause marked posterior lamella shortening with shallow or absent fornix. These cases are often associated with symblepheron, dry eye, corneal vascularization and opacification making the problem more complex.

The main management problems posed by severe and mismanaged cases of entropion are :

- 1) Constant relative shortening of the posterior lamellar lid tissue.
- 2) Loss of rigidity of the eyelid.

The standard techniques fail to correct these difficult problems. More complex techniques or a combination of techniques have to be performed.

Surgical Techniques for Severe Cicatricial Entropion

The procedures suitable for severe cases of cicatricial entropion include.

Extensive mucosal grafts to line the lid margin.

Grafts providing support to the lid margin using palatal chondromucosa, aural or nasal septal cartilage.

Posterior lamellar lengthening by spacer grafts consisting of mucous membrane, banked sclera or cartilaginous graft.

Lid reconstruction in cases of entropion associated with lid coloboma.

Unfortunately, these grafts add to the complexity of the repairs and the graft viability is unpredictable due to the poor vascularity of those scarred lids.

Anterior Lamellar Repositioning with Mucous Membrane Graft

This is the procedure of choice in cases of severe entropion associated with posterior lamellar shortening and lagophthalmos.

Method : (Fig 10)

The technique is similar to that described by Van Millegen⁶.

Lid is split at the muco-cutaneous junction into anterior skin muscle and posterior tarso-conjunctival lamella.

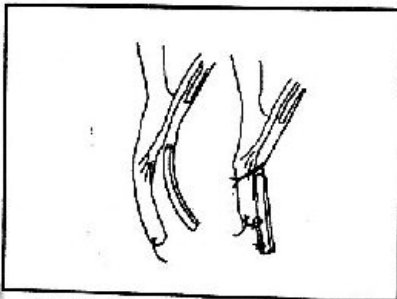


Fig. 10 : Mucous membrane grafting.

The posterior lamella is shifted downwards and fixed here with 4 mattress sutures so that the tarsal edge projects 4 mm below the ciliary edge.

As the eyelid margin is split along the grey line, care must be taken to leave the cilia follicles with the anterior lamina of skin and orbicularis. If some cilia follicles extend into the marginal tarsus and are ignored they will in time

grow out behind the mucosal graft and traumatize the cornea.

If there are several aberrant posterior cilia it is better to excise a strip of marginal tarsus containing the follicles and apply a larger mucosal graft.

Mucosal graft is harvested from the lower lip. It should be as thin as possible and 33% larger than the size of the bed.

The sutures, (6-0 silk) holding the graft are left long enough to tie over a cotton roll which has been dipped in antibiotic solution. Sutures are removed after 7 days.

In the initial post-operative period the graft appears red, inflamed and prominent. With time the graft gets incorporated in the posterior lamella and becomes inconspicuous.

Posterior Lamellar Graft

This is the procedure of choice for severe entropion with marked posterior lamellar shortening and thinned or absent tarsus.

Method : (Fig 11)

A horizontal incision is made in whatever remains of the tarsal plate. The terminal tarsal fragment is dissected and everted.

A graft consisting of palatal chondromucosa, aural or nasal septal cartilage or buccal mucous membrane is sutured into the defect

between the upper tarsal fragment and the everted lower fragment.

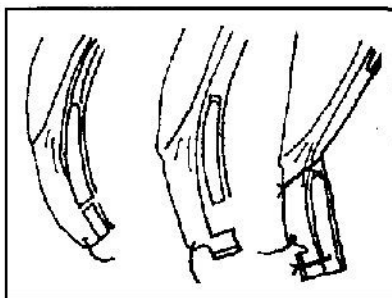


Fig 11 : Posterior lamellar graft.

Conclusion

In majority of cases a meticulous surgical technique and timely intervention give excellent results. Appropriate case selection and adhering to the basic principles of anatomy go a long way to prevent the problems of mismanaged cicatricial entropion. In cases with gross deformity or where the cicatrizing process is still continuing, standard techniques fail and a combination of more complex procedures have to be employed.

Reference

1. Kemp EG and Collin JRO. Surgical management of upperlid entropion Br J Ophthalmol. 1986; 70:575-579.
2. Ewing LE. An operation for atrophic (cicatricial) entropion of the lower eyelid. Am J Ophthalmol 1903; 20:39-40.
3. Kersten RC, Kleiner FP, Kulwin DR. Tarsotomy for the treatment of cicatricial entropion with trichiasis: Arch Ophthalmol 1992; 110:714-717.
4. Ghose S, Sood NN, Dayal Y. Some observations on the common procedure of tarsal wedge resection for cicatricial entropion of the upper eyelid; Ind J of Ophthalmol 1981; 29:385-387.

5. Trabut G. Entropion- trichiasis en Afrique du nord; Arch Ophthalmol 1949; 9:701-707.
6. Collin JRO : A manual of systematic eyelid surgery, ed. 2, London: Churchill-Livingstone, 1989:7-26.
7. Seiff SR, Susan R, Tovilla JL and Choo PH : Tarsal margin rotation with posterior lamella super-advancement for the management of cicatricial entropion of the upper eyelid; Am J Ophthalmol. 1999; 127: 67-71.
8. Vanmillegen EV : The tarso cheiloplastic operation for the cure of trichiasis. Ophthalmic Rev; 6:309-314,1887.

GUIDELINES FOR MANAGEMENT OF INVOLUTIONAL ENTROPION

DR. G. CHANDRA SEKHAR

Introduction

Involutional entropion of the lower lid is a common surgical problem. A proper understanding of the altered anatomy and the pathogenesis of the condition are essential to achieve good surgical correction. A brief description of the relevant anatomy, the pathogenesis and the surgical technique used by the author are presented.

The normal position of eye lid in relation to the globe needs to be appreciated in the three axes. Changes in the vertical axis will produce ptosis or lid retraction as is clinically evident for the upper lid. Changes in the horizontal axis present as horizontal lid laxity. Changes in the antero-posterior axis present as entropion or ectropion. In the causation of senile entropion, changes in all the three axes are involved. The stability of the lid in the vertical axis is provided by the inferior lid retractors. In the horizontal axis the tarsal plate and the medial and lateral canthal ligaments with their attachments to the bony orbit give the lid its stability. In the presence of laxity in these two axes the over riding of the pre-septal orbicularis on to the pre-tarsal orbicularis results in the tipping of the lid at its margin backward towards the globe resulting in entropion.

Anatomy

The pre-tarsal orbicularis is firmly attached to the tarsal plate, whereas the pre-septal orbicularis is loosely attached and has a tendency to migrate on to the pre-tarsal orbicularis. The attachments of the eyelid retractors of the inferior rectus play a vital role in determining the position of the lower lid tarsus and margin relative to the globe. The origin of the capsulopalpebral head of the inferior rectus muscle is from the terminal muscle fibers and the tendon of the inferior rectus. This divides into two portions, which go around the sheath of the inferior



Fig. 1: Anatomy of the inferior lid retractors. T: tarsus, O: orbicularis, F: fornix, Te: tenon's capsule, SO: orbital septum, OF: Orbital fat, IO: inferior oblique, IP: inferior rectus, L: Lockwood's ligament, SPH: capsulo-palpebral head, CPF: capsulo-palpebral fascia, ITM: inferior tarsal muscle.

oblique muscle; and anterior to the inferior oblique fuse to form the "capsulopalpebral fascia". The capsulopalpebral fascia is separated from the orbital septum by a pad of fat near the orbital floor and is attached superiorly to the tarsus (Fig.1).^{1,2}

Pathogenesis

The earlier concept that spasm of muscle of Riolo and other orbicularis fibers alone caused entropion led to this condition being termed as spastic entropion. Though isolated spasm of orbicularis muscle alone is usually not adequate in causing entropion, migration of the pre-septal orbicularis upward and forward over the lower end of tarsus plays a significant role in entropion.

The laxity of the inferior lid retractors in senility leads to instability of the lower border of the tarsus and its rotation forward is the main cause of Involutional entropion. Apart from laxity, evidence for disinsertion of these retractors, both clinical and surgical, was presented as a cause of entropion.³ The clinical evidence for disinsertion of inferior retractors is the subconjunctival redness seen below the lower border of tarsus. This



Fig. 2 : Clinical photograph showing marked horizontal lid laxity.

is due to the visibility of orbicularis through conjunctiva in the absence of retractors there.

The other important factor in the pathogenesis of entropion is the horizontal laxity of the lower lid causing instability of the lid margin. This may be real due to laxity of the eyelid tissues (Fig.2) or relative due to an enophthalmos in the elderly secondary to atrophy of the orbital fat.³

Surgical Correction of Entropion

"No operation designed to correct the aging changes that affect the lid tissues can be completely successful since by definition these changes are progressive"—Collin⁴

In spite of the above statement, the understanding of the pathogenesis of involutional entropion helped in devising effective surgical means of correcting this problem.

Based on the understanding of the altered anatomy involved in this condition, the principles involved in the surgery are :

- i. Reattachment of the retractors to the tarsal plate, providing stability to the lid in the vertical axis.
- ii. Correction of the horizontal lid laxity by the tarsal strip procedure.
- iii. Suturing the pre-septal orbicularis to the pre tarsal orbicularis with the suture encompassing the advanced retractor tissue. This prevents the migration of the orbicularis by forming a cicatrix between the two parts of the orbicularis.

The surgical approach is shown in Fig.3. A skin incision is made in the subciliary area. The initial dissection is in the subcutaneous plane up to the lower border of the tarsus. At this level, the orbicularis is split along the inferior border of the tarsal plate and the dissection proceeds in the submuscular plane to identify the post septal fat and the retractor tissue posterior to it. In some cases because of the retractor dehiscence, the cornea is seen through the conjunctiva once the orbicularis is separated (Fig.4). Holding

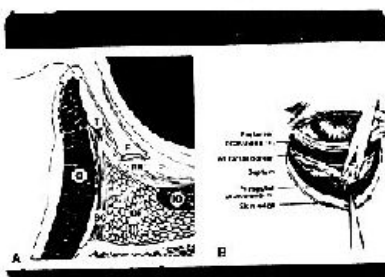


Fig. 3 : Surgical approach to the lid retractors is shown along the dotted line. The abbreviations are the same as for Fig.1.

the retractor tissue in forceps and asking the patient to look down can confirm the nature of the tissue (Fig.5). The horizontal lid laxity is reassessed at this stage and the lateral tarsal strip procedure is carried out if there is significant horizontal laxity. This involves a lateral canthotomy and cantholysis. The edge of the released lid is held in a forceps, the amount of laxity is assessed, and excising the appropriate amount of the lid (Fig.6) achieves the horizontal-tightening eyelid. From the lateral end of the lid a small strip of lid margin, conjunctiva and skin are removed to



Fig. 4 : Intraoperative picture showing the cornea seen through the conjunctiva in the sub muscular plane.



Fig. 5 : Interior lid retractor tissue held in forceps



Fig. 6 : Intraoperative picture of the same patient in Fig.3 showing the amount of lid excised to correct the horizontal laxity.



Fig. 7 : Tarsal strip has been formed in the same case as in Figs.3 and 6.



Fig. 8 : Suture (6-0 vicryl) being passed through the retractor tissue.



Fig. 9 : Retractors sutured to the tarsal plate.

create a free end of the tarsal plate that will function as the lateral canthal ligament (Fig.7). This is sutured to the periosteum of the lateral wall of the orbit with 4-0 prolene on a half circle-cutting needle. The inferior lid retractors are attached to the tarsal plate with 6-0 vicryl suture (Figs 8,9). Usually three sutures are needed across the width of the tarsal plate. The pre-septal orbicularis is sutured to the pre-tarsal orbicularis with 5-0 chromic catgut. The sutures also incorporate the edge of the retractor tissue that has been attached to the tarsal plate. Depending on the excess skin present excision of the loose skin can be carried out at this stage and the skin incision closed with interrupted silk or a continuous prolene as per the surgeon's choice. Figures 10,11 show the pre and post operative appearance in a patient with retractor surgery along with



Fig. 10,11 : Pre and post operative appearance in the same patient as shown in Fig. 3, 6.



Fig. 12,13 : Pre and postoperative appearance after lid retractor surgery for involutional entropion.

lateral tarsal strip procedure. Figures 12.13 show the pre and post operative appearance in a patient with retractor surgery without lateral tarsal strip procedure.

For the correction of involutional entropion, the altered anatomy is corrected with a combination of procedures, which produce both horizontal and vertical lid tightening.

References

1. Jones LT : The anatomy of the lower eyelid and its relation to the cause and cure of entropion. *Am J Ophthalmol* 1960; 49:29-36.
2. Hawes MJ and Dortzbach RK : The microscopic anatomy of lower eyelid retractors, *Arch Ophthalmol* 1982; 100:1313-18.
3. Dortzbach RK, McGettrick JJ : Involutional entropion of the lower eyelid, *Adv Ophthal Pl Reconstr Surg* 1983; 2:257-67.
4. Collin JRO, Rathbun JE : Involutional entropion : A review with evaluation of a procedure, *Arch Ophthalmol* 1978; 96: 1054-64.

MANAGEMENT OF CICATRICAL ECTROPION

DR NIRMALA SUBRAMANIAN

Cicatricial ectropion is the outward turning of the eyelid margins due to cicatrix on the anterior lamellae of eyelids. In other words there is a deficiency in the skin and muscle of the eyelids.

Etiology of the Cicatrix

1. Post Traumatic

- Injury to the eyelid skin
- Injury to full thickness of eyelid
- Injury to periorbital structures

2. Burns

- Thermal
- Chemical (acid and alkali) burn
- Radiation burn

3. Post Surgical

- Following excision of tumor
- Following Blepharoplasty
- Re-exploration of orbital fracture

4. Chronic inflammations of skin

- Primary
- Secondary

5. Dermatological conditions

6. Secondary cicatricial forces in the periorbital region.

Problems due to ectropion

Conjunctiva	Dryness
	Conjunctival hyperemia
	Chronic inflammation and Keratinization
Cornea	Keratitis
	Corneal ulceration
	Corneal perforation
Punctal occlusion & epiphora	
Examination	

- Extent of ectropion
 - (A) Mild degree
 - Moderate degree
 - Severe degree
 - (B) Localised
 - Periorbital involvement
- Site
 - Upper lid
 - Lower lid
 - Both eyelids
- Duration
 - Acute
 - Chronic
- Degree of lagophthalmos
- Corneal status
- General physical examination
- Keloidal tendency
- Donor site

Treatment

Nonsurgical

Massage to scar
Lubrication to eye

Surgical

treatment depends on
(A) absence of tissue loss
(B) presence of tissue loss

Treatment of ectropion *in absence of tissue loss*

This entails revision of the scar.

Resuturing with proper alignment
Revision with incorporation of Z-plasty

Principle of Z-plasty (Figs 1 and 2)

Z-plasty is a technique by which two triangular flaps are transposed to achieve

- 1) change in the direction of the scar so that it lies in the same direction as the skin lines to prevent pull of the scar
- 2) Increase the length of the skin by transposing the flaps

(B) Treatment of ectropion *with tissue loss*

This involves replacement/addition of tissue to anterior lamelle :

- Split skin grafting
- Full thickness skin graft
- Flap cover

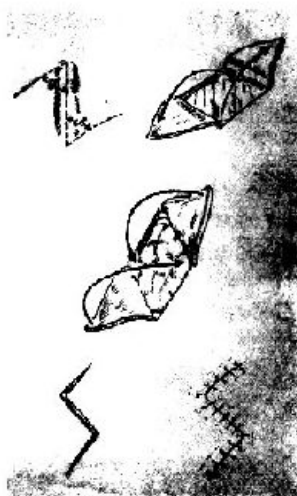


Fig. 1 : Z-plasty



Fig. 2 : Post Traumatic Ectropion Release with Z-plasty

Guidelines for Management :

The commonest cause of cicatricial ectropion of eyelids seen in our country is burns. In thermal burns the cornea initially gets protected initially due to reflex closure of the lids. However due to thinness and the inherent mobility of the eyelid, deformity of the eyelid can result from seemingly superficial burns can lead to deformity of the eyelid. Burns due to acid produce severe ectropion not just primarily but also secondarily due to scarring of the periorbital skin.

Basic guidelines for correction of ectropion due to burns are as follows:

1. One eyelid at one time.
2. Preferably upper eyelid first.
3. Aim at overcorrection.
4. Aesthetic unit to be kept in mind.
5. Preferably lighter graft for the upper eyelid.(more often partial thickness)

Thicker & stiffer grafts for lower eyelid. (full thickness preferred)

Hairless and color match of graft vital.

Surgical details

The Surgical technique for skin grafts may be considered separately for the upper and lower lid.

Upper Eyelid (Fig. 3)

Incision : depends upon the condition of the pretarsal skin

- A few millimetres above the lash line
- Above supratarsal fold

Incision should extend

- Temporally beyond lateral canthal line
- Medially upto the nose
- Medial & lateral ends should be Y-shaped

Orbicularis should not be sacrificed

Hemostasis should be achieved

Graft should be well anchored

Lower Eyelid (Fig. 4)

Incision

Subciliary

Medially below medial canthus upto the nose

Laterally beyond lateral canthus

Undermining of the lid margins should be done to unfurl it and obtain connection of ectropion before placing the graft.

Aesthetic unit should be respected. Infra-orbital margin should not be transgressed.

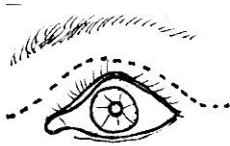


Fig. 3 : Post Burn ectropion upper eyelid Release & skin graft

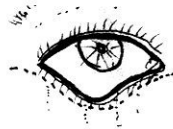


Fig. 4: Post burn ectropion lower lid release & skin graft

Donor sites

Full thickness skin graft & partial thickness skin graft

Upper eyelid Post auricular, supraclavicular, Inguinal, Medial side of upper arm, Scalp.

Lower eyelid Post auricular, upper eyelid, supraclavicular, inguinal, **abdomen, upper arm, scalp**

Flap Local flap
Opposite eyelid
Forehead medial or lateral
Temporal skin
Distant flaps depending upon the size of the defect on the face

Postoperative care

Graft to be seen in 5-7 days

Tarsorrhaphy may be needed

Massage to the graft after ten days

Pressure with silastic gel sheet

Re release if recurrence occurs.

Complications

Hematoma

Infection

Graft loss

Shrinkage of graft

Lid border irregularity

Recurrence

References

1. Tyres AG, Collin JRO : Colour atlas of Ophthalmic Plastic surgery.
2. Orbit, Eyelids and Lacrimal system. American Academy of Ophthalmology, Section 7;1995-96.
3. Nesi Frank A, Lisman Richard D, Levine Mark R. Smith's Ophthalmic plastic and reconstructive surgery; 2nd edition.
4. Plastic Surgery. Smith James W. IV Edition; Little Brown & Co.
5. Mc Gregor IA, Fundamental techniques of plastic surgery – Churchill Livingstone; II Edition.

INVOLUTIONAL ECTROPION

DR. V.P. GUPTA

Involutional ectropion is the commonest cause of lower lid ectropion. Several involutional changes occur in the eyelid with the advancing age. Involutional changes include lower lid laxity, laxity of lateral and medial canthal tendons, atrophy of orbicularis oculi and lid skin. Disinsertion, dehiscence or laxity of inferior lid retractors also contribute in the pathogenesis. Although involutional ectropion affects only lower eyelid, upper eyelid ectropion occurs in floppy eyelid syndrome. The tarsal plate remains stable & healthy in most of the cases. There is generalized loss of elastin. There is narrowing of vertical and horizontal dimensions of palpebral aperture. Decrease in vertical dimension is due to dehiscence, disinsertion or atrophy of levator aponeurosis and inferior lid retractors. Decrease in horizontal palpebral aperture occurs due to laxity of medial and lateral canthal tendons. Involutional ectropion may manifest as punctal eversion, medial ectropion, lateral ectropion, ectropion of entire eyelid (generalized ectropion). Severe long standing generalized ectropion results in conjunctival exposure, inflammation, hypertrophy and keratinization. The problems caused by involutional ectropion are epiphora, chronic discomfort & redness due to conjunctival and corneal exposure and cosmetic deformity.

Preoperative evaluation/workup of involutional ectropion

Recording the symptoms- Epiphora, Dryness, redness, discomfort, pain, cosmetic abnormality.

Detailed examination of puncta & eyelids including slit lamp examination; tear pooling, overflow, punctal eversion, medial ectropion, generalized ectropion, conjunctiva and corneal exposure.

Syringing.

Jones dye tests - Primary & secondary.

Schirmer tests

Tests for lid laxity (lid redundancy) & elasticity.

Pinch Test :

Pull the lower lid away from the globe. If lid can be displaced forwards by 6-8 mm or more lid laxity is present.

Snap Back Test :

Pull the lower lid downwards and forwards and then release. 1. A

normal eyelid returns to its normal position quickly without any blinking. If lid laxity is present the distracted lid does not snap back quickly.

Laxity of Medial Canthal Tendon :

Pull the medial part of eyelid laterally. Inferior punctum can be pulled upto nasal limbus in laxlids.

Lateral Canthal Tendon Laxity :

Lateral canthus can be pulled medially upto temporal limbus in laxlids.

Management

Involuntional ectropion is a difficult clinical problem. The goal of any surgery for involuntional ectropion is to achieve an eyelid which is tight and well opposed to the globe so that there is no epiphora and cosmetic lid deformity. Tightening of the eyelids is achieved by correcting the laxity of canthal tendons and other lax structures of eyelid. A variety of procedures have been described to achieve this goal. Different procedures are used to correct laxity of different lax components of eye lid. Proper clinical evaluation plays an important role in identifying the site of laxity. The right procedure at the right site gives the right result. When a laxity of the medial canthal tendon exists, unless it is corrected, neither epiphora nor medial ectropion will be relieved. In the past many procedures have been advocated for involuntional ectropion and have been effective to some extent but they did not attack the correction of laxity at its origin.

Snellen sutures and Ziegler cautery have been effective only in mild cases of ectropion and did not correct the laxity of canthal tendons. Adams, Von Amon and Bick described V-shaped full thickness lid resection for correction of ectropion. However, these procedures led to notching and lateral canthal deformity. Fox described wedge shaped resection of tarsoconjunctiva with base up towards the lid margin. Kuhnt-Szymanowski procedure tightens the lid adequately. Byron Smith modification of Kuhnt-Szymanowski procedure offers several advantages over the original procedure. However, the major disadvantage of this and several other eyelid shortening procedures is that they unnecessarily resect the mid tarsal portion of the eyelid and do not correct the laxity of canthal tendons. The operation results in phimosis of palpebral aperture, sacrifices many tear producing structures and pulls the punctum laterally.

In this chapter, the following operations for involuntional ectropion have been described in detail :

1. Medial spindle procedure (Medial tarsoconjunctivoplasty).
2. Medial canthal tendon plication.

3. The "Lazy-T" procedure.
4. Modified Kuhnt-Szymanowski operation
5. Lateral canthal tendon sling.
6. The lateral tarsal strip procedure.
7. The fascial sling procedure.
8. Medial fullthickness resection with posterior MCT plication and canaliculostomy (Medial canthal resection).

Medial Spindle Procedure¹ **(Medial Tarsconjunctivo-Plasty)**

Punctal eversion interferes with the normal drainage of tears as well as corneal wetting physiology. The main goal of surgical repair for punctal eversion is to reestablish the anatomic and physiologic relationship of the lacrimal punctum and the lower lid margin. Retropunctal excision of a diamond/spindle of conjunctiva and lower eyelid retractors is an excellent procedure to accomplish this goal.

Technique :

The procedure is performed under surface and infiltrative anaesthesia. Pass two 4-0 silk traction sutures in lower lid. Evert the lid over a lid spatula. Pass a fine lacrimal probe in the inferior canaliculus. The probe is left in place throughout the operation. A diamond/spindle is marked with GV paint in the retropunctal area. The size of the spindle is about

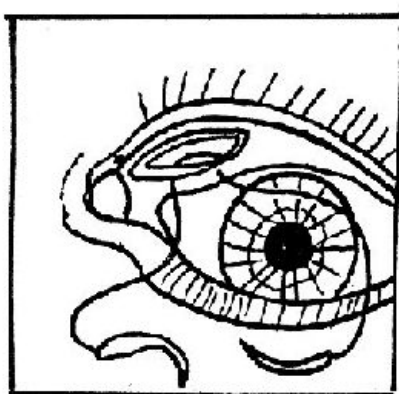


Fig. 1 : Medial spindle procedure : Inferopunctal resection of spindle of tarsconjunctiva and inferior lid retractors. Double armed 6-0 Vicryl suture is being passed through lower edge of the spindle

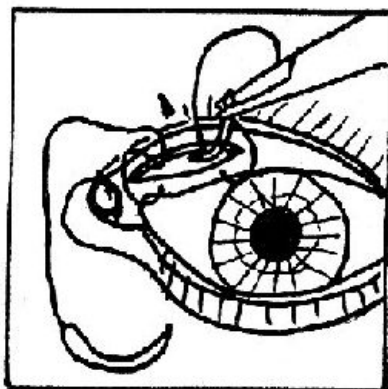


Fig. 2 : Medial spindle procedure : The suture has been passed through the upper edge of the spindle and the needle being passed through the centre of the wound to emerge on the skin surface.

4mmx8mm or 5mmx10mm(Fig.1). The medial end of the spindle is 3-4mm below the punctum. The spindle of conjunctiva or tarsoconjunctiva and eyelid retractors is resected with the help of knife and then fine westcott scissors & forceps. The spindle is closed with 6-0 vicryl interrupted sutures. Nowinski and Anderson¹ described a different suturing technique in the form of a double armed vertical mattress suture(Fig.1). The needles emerge on the skin surface and is tied with moderate tension so that inversion of medial lid margin takes place(Fig.2).

This is a simple, quick and effective procedure to correct mild medial ectropion or punctal eversion.

Complications :

1. Canalicular damage-Inferior canaliculus may be damaged if the placement of the spindle is incorrect and is too close to the canaliculus. A thin lacrimal probe should be placed in the canaliculus before resecting the spindle to avoid canalicular injury.

2. Failure of the procedure - The procedure is likely to fail if it is done in wrong cases having severe laxity of medial & lateral canthal tendons & elongation of eyelid.

Medial canthal tendon plication²

This procedure is indicated for correction of medial canthal tendon laxity which is the cause of medial ectropion and punctal eversion.

Technique :

Apply two or three 4-0 silk traction sutures in lowerlid.

Pass a fine lacrimal probe into inferior canaliculus. Skin Incision is given 2-3 below and parallel to non ciliary lower lid margin and extends upwards just above the medial canthal ligament. Undermine the skin

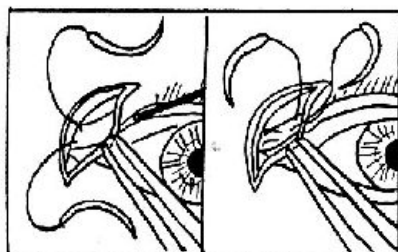


Fig. 3: (A) Medial canthal tendon has been exposed and double armed 5-0 prolene mattress suture being passed near the insertion of inferior crus of MCT (B) The longitudinal mattress suture emerges near the origin of inferior crus on the tarsal plate.

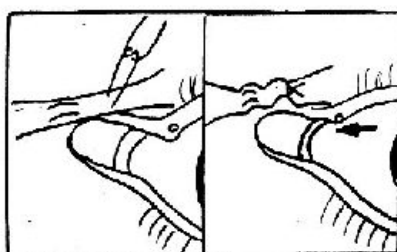


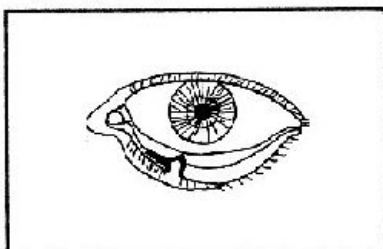
Fig. 4: (A) The mattress suture being tied. (B) The plication of inferior crus of MCT completed.

and expose the orbicularis oculi tendon. Dissect the inferior crus of tendon upto its insertion to the anterior lacrimal crest(Fig.3a). Tucking/plication of the inferior crus of medial canthal tendon is performed by passing a longitudinal mattress suture of 5-0 prolene suture(Fig.3b). Tie the suture with moderate tension to decrease the laxity of medial canthal tendon (Fig. 4a & 4b). Skin is closed with 6-0 black silk interrupted or subcuticular running stitches. This is a simple, quick and effective procedure to relieve epiphora due to medial ectropion or punctal eversion because of medial canthal tendon laxity.

The Modified "Lazy-T" procedure³

This operation corrects the horizontal as well as the vertical laxity. Full thickness lid margin excision is performed 4mm lateral to the lower punctum in a vertical pentagon or a wedge (v) shaped manner(Fig.5).

The exact amount of eyelid to be resected is measured by the overlapping of the free edges of lid margin after giving initial vertical cut in the lid margin. Vertical laxity is corrected by infrapunctal excision of a wedge or spindle of tarso-conjunctiva and inferior lid retractors (4-5mm vertically and 8-10 mm



horizontally)(Fig.5). The broad base of the wedge is placed laterally. The injury to inferior canaliculus is avoided by placing a fine lacrimal probe in the canaliculus. The horizontal incision is closed with 6-0 vicryl suture with buried knots to prevent postoperative corneal irritation. The fullthickness marginal lid defect is closed by direct layered closure technique. Two or three 5-0 vertical mattress sutures are applied at the lid margin. Tarso-conjunctiva, muscle and skin are closed in layers.

Fig. 5 : The Lazy-T Procedure, Full thickness resection of vertical pentagon of lid just lateral to the punctum and excision of tarsoconjunctiva horizontally just below the punctum.

Modified Kuhnt – Szymanowski Operation^{4,5}

This procedure is indicated for severe generalised involutional ectropion from diffuse horizontal cyclid laxity.

Technique :

Subciliary incision is given 2-3mm away from lid margin. The incision begins at the junction of medial one third and lateral two thirds running parallel to the lid margin; extends slightly above and lateral to the lateral canthus and then downward for about 1 cm(Fig.6). Skin muscle flap is elevated(Fig.7). Full thickness wedge of lid margin is resected depending

upon the amount of horizontal laxity. Initially an angular cut (downward and medially) is made in the fullthickness lid margin at the junction of middle and lateral third extending upto the inferior fornix. Now the lateral cut end of middle third of lid margin is overlapped over the lateral third to judge the exact amount of lid margin to be excised. The lid margin to be excised is marked and resected so that a 'V' shaped excision takes place. Lid margin is closed as described in chapter on lid reconstruction. Alternatively vertical pentagon shaped excision of full thickness lid margin can be performed instead of 'V' or wedge shaped excision(Fig.7). Skin muscle flap is pulled upwards & laterally to correct horizontal laxity. Excess of triangle of skin muscle is removed(Fig.8). The wound is closed in layers(Fig.9). Plication of the medial canthal ligament may also be combined if necessary.

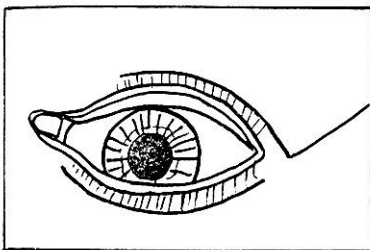


Fig. 6 : Subciliary incision 2-3 mm below lid margin in the lateral two third of the Lid. The incision extends just above the canthus & then downwards for about 1 cm.

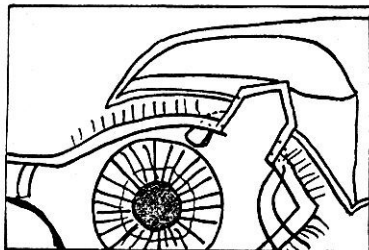


Fig. 7 : Skin-muscle flap has been elevated. Vertical pentagon shaped resection of full thickness lid margin in the lateral third of lid.

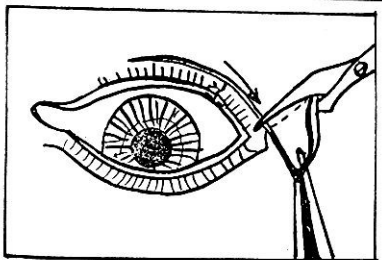


Fig. 8 : Vertical pentagon has been sutured. Skin-muscle flap pulled laterally to excise excess of skin.

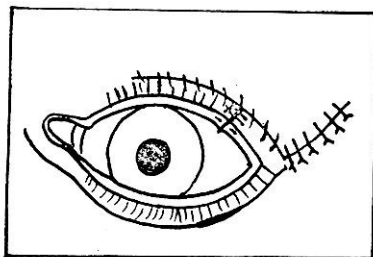


Fig. 9 : Skin-muscle flap sutured.

Although horizontal tightening of the lid is produced in many operations by wedge, V-shaped or pentagonal full thickness marginal, or tarso-conjunctival resections, e.g. Bick's procedure, Kuhnt-Szymanowski, Lazy-T procedure and Fox's operation; these operations do not correct the basic pathological defect i.e. the laxity of canthal tendons; rather they unnecessarily resect the normal tarsus which is not at fault.

Lateral canthal tendon sling

It was described by Tenzel et al in 1977⁵. He corrected the marginal ectropion of lower lid by using the lateral canthal tendon sling. The surgery involves lateral canthotomy and cantholysis of the inferior crus of lateral canthal tendon. The lid is pulled temporarily till it is well apposed to the globe. Tarsal strip is isolated and is fixated to the periosteum of the orbital rim using a 4-0 nylon suture. Physiological and cosmetically acceptable results are reported by correcting the horizontal lid laxity. In advanced cases it can be combined with resection of the conjunctiva and lower lid retractors. The procedure is not effective in very lax lids.

The lateral tarsal strip procedure⁷

This procedure is a further modification over the lateral canthal tendon sling operation. This procedure is very useful to correct involutional lower lid laxity and lateral canthal tendon laxity or malposition. The lateral canthal tendon laxity or elongation is corrected with use of lateral tarsal strips. Some horizontal lid laxity is also corrected.

Technique

Perform lateral canthotomy after making the eyelid taut and extend it for 1 cm (Fig. 10a). Expose the inferior crus of lateral canthal tendon (LCT) by performing blunt dissection on lateral orbital rim (Fig. 10b). Cantholysis of inferior crus of LCT is done (Fig. 10b). The eyelid is split at gray line with fine scissors into anterior skin muscle and posterior tarsoconjunctival lamellae. The distance of lid splitting depends upon the amount of lid to be resected. 3-4mm wide tarsal strip is fashioned by excising the strip of marginal epithelium and cutting the attachment of the inferior lid retractors and conjunctiva (Fig. 11). The conjunctival epithelium is scraped from the posterior surface of tarsal strip (Fig. 12). The tarsal strip is now sutured to the periorbita inside the lateral orbital rim or the stump of LCT with a

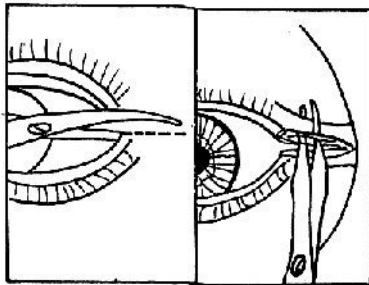


Fig. 10 (A) - Lateral Canthotomy is being performed (B) Cantholysis of inferior crus of LCT

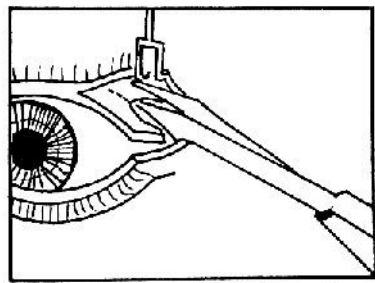


Fig. 11 - Splitting of the lid at grey line and cutting of inferior lid retractors and conjunctiva from the inferior border of tarsal plate.

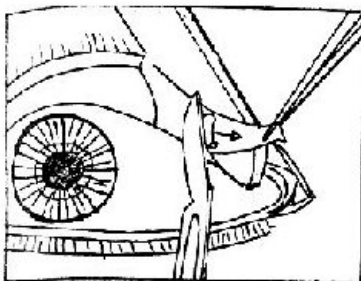


Fig. 12 : Marginal epithelium from the free border of tarsus has been excised and conjunctival lining of tarsus being scraped.

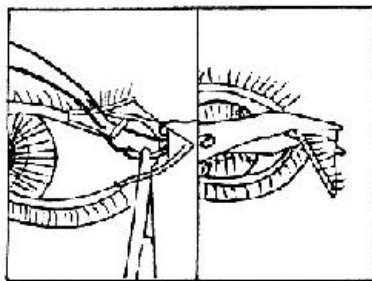


Fig. 13 (A) : Suturing of the tarsal strip to the periosteum of the internal side lateral orbital rim with a 4-0 prolene suture (B) Pull the skin muscle flap to excise the excess of skin muscle flap.

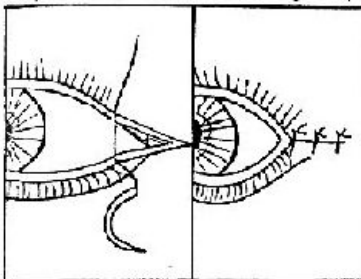


Fig. 14 (A) : Lateral Canthus being reformed (B) Skin-muscle flap & Canthotomy incision sutured.

4-0 vicryl suture on a spatula needle (Fig. 13a). Vertical placement of suture corrects ectropion. Anterior lamella including eyelashes is excised (Fig. 13b). Lateral canthal angle is reformed with an interrupted 6-0 vicryl suture. Lateral canthotomy is closed with 6-0 silk interrupted sutures (Fig. 14a & 14b).

Advantages of lateral tarsal strip

procedure

The procedure offers the following advantages :

1. Corrects the anatomic defect i.e. laxity of LCT is corrected.
2. No chances of lid notching or irritation caused by sutures at lid margin.
3. Only adequate eyelid shortening is performed preserving baseline tear secretors.
4. No post operative phimosis of palpebral aperture.
5. Midtarsal portion of eyelid is not removed.
6. Avoids recurrence of LCT laxity.
7. Quick and very effective.
8. Almond-shape of lateral canthus is retained.
9. Effective even in cases where lid shortening procedures failed.

The procedure can also be used on the medial side in patients with nonfunctional nasolacrimal system.

Fascial sling procedure

This procedure is indicated in patients with severe diffuse involutional ectropion due to severe laxity^{6,9}.

Autogenous or preserved fascia lata may be used. Fascia overlying the temporalis muscle also gives equally good results.

Vertical skin incision is given over MCT to expose the tendon. Subciliary skin incision 3mm away from lid margin is given in the central third of the eyelid. Lateral canthotomy and cantholysis of inferior crus of LCT is performed. A 4mm wide fascial strip is placed between the tarsus and orbicularis muscle with the help of Wright's fascia lata needle. The medial end of the strip is passed under the MCT and sutured to MCT after making a loop of fascia. Horizontal tightening of the lid is performed by performing adequate full thickness lid excision in the lateral part and suturing it to the periosteum of the internal orbital rim with mattress non-absorbable 5-0 suture. The lateral end of the fascia is stretched and sutured to the periosteum of the lateral orbital rim with 4-0 prolene suture. In case of temporal fascia, it is naturally attached at the lateral end and only needs to be anchored to the MCT.

Medial fullthickness resection with posterior MCT Plication and Canaliculostomy (Medial canthal resection)

This procedure was described by Mc Cord¹⁰. Crawford described the efficacy of this procedure in paralytic ectropion. Sullivan & Colin¹¹ have reported similar procedure and termed it as medial canthal resection. This procedure is indicated for severe medial ectropion associated with marked laxity of MCT. The operation is utilized for both involutional & paralytic severe medial ectropion. It consists of resection of medial canthal structures after passing a lacrimal probe in the inferior canaliculus. The wedge or vertical pentagon shaped fullthickness lid resection involves structures lateral to the lower punctum, medial canthal tendon and the inferior canaliculus just lateral to the caruncle & lower half of the caruncle if necessary(Fig.15). The inferior canaliculus is dissected from the surrounding tissues and is marsupialised into the conjunctival sac. Bicanalicular silicone intubation is performed and left in place for a period of 3-6 months(Fig.16). The medial cut end of tarsal plate is sutured to the posterior reflection of the MCT or to

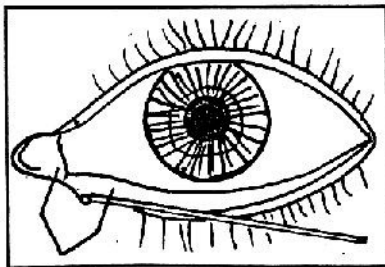


Fig. 15 : Lacrimal probe has been passed into the punctum. Marking of vertical pentagon to be excised.

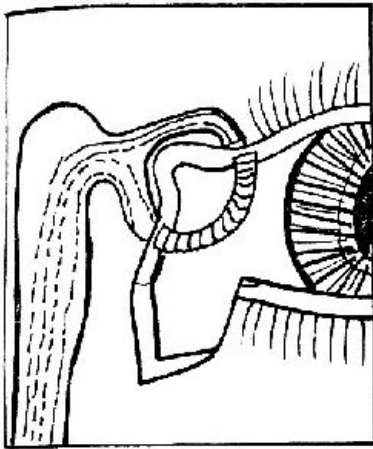


Fig. 16 : Resection of full thickness vertical pentagon including punctum and Bicanalicular silicone intubation through the upper & stump of the inferior canaliculus.

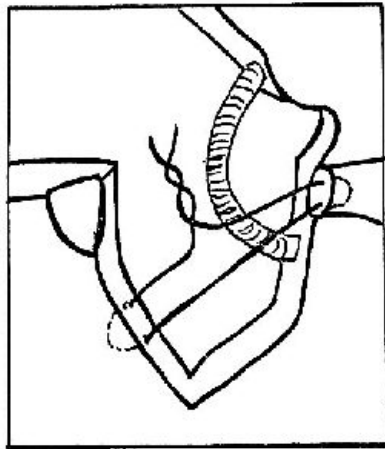


Fig. 17 : Suturing of lower lid to the posterior reflection of the medial Canthal tendon (view from behind)

the periosteum of the posterior lacrimal crest behind the plica with a 4-0 or 5-0 prolene suture (Fig.17). The conjunctival wound is sutured with 6-7-0 vicryl and skin is closed with 6-0 silk suture. In some patients of medial ectropion with dry eyes epiphora does not occur. Their main problem is ectropion with lagophthalmos and exposure. In such cases medial fullthickness resection is performed without any marsupialization and canalicular intubation.

Conclusion

Involuntional ectropion is caused by laxity of canthal tendons and other eyelid structures. Medial ectropion is the earliest manifestation and creates troublesome epiphora. Proper prior evaluation would guide in deciding the right surgery at the right site. Various surgeries which tighten the eyelid by resecting the tarsalplate in various ways should be discouraged as they do not correct the laxity of canthal tendons.

References

1. Nowinski TS and Anderson RL : The medial spindle procedure for involuntional medial ectropion. Arch Ophthalmol 1985; 103: 1750-1753.
2. Jelks GW, Smith B and Bosniak S: The evaluation and management of the eye in fascial palsy, Clin Plast Surg 1979; 6:397.
3. Smith B: "Lazy-T" correction of ectropion of the lower punctum. Arch

Ophthalmol 1976; 94: 1149-1152.

4. Fox SA: A modified Kuhnt-Szymanowski procedure. Am J Ophthalmol 1966; 62:533.
5. Smith B and Cherubini TD.P Modification of Kuhnt-Szymanowski ectropion repair, Oculoplastic surgery : a compendium of principles and techniques. St. Louis, 1970, Mosby-Year Book.
6. Tenzel RR, Buffan FV, Miller GR : The use of the "lateral canthal sling" in ectropion repair, Can J Ophthalmol 1977; 12: 199-202.
7. Anderson RL & Gordy DD. The tarsal strip procedure, Arch Ophthalmol 1979;97: 2192-2196.
8. Wiggs EO, Guibor P, Hecht SD et al: Surgical treatment of the denervated or sagging lower lid, Ophthalmology, 1982;89:428.
9. Vistnes LM, Iverson RE and Laub DR: The anophthalmic orbit, surgical correction of lower eyelid ptosis, Plast. Reconstr Surg 1973; 52:346.
10. Mc Cord CD: Canalicular resection and reconstruction by canaliculostomy, Ophthalmic Surg 1980; 11:440-5.
11. Sullivan TJ, Collin JRO: Medial canthal resection: an effective long-term cure for medial ectropion Br J Ophthalmol 1991; 75:288-291.

CONGENITAL PTOSIS - EVALUATION AND MANAGEMENT

DR. A.K. GROVER

Congenital ptosis results from a developmental dystrophy of the levator muscle of unknown aetiology. It comprises the simple ptosis, ptosis associated with elevation anomalies : blepharophimosis syndrome and the Marcus Gunn jaw winking ptosis. Management of the condition requires a thorough understanding of the surgical anatomy and a meticulous surgical technique based on a proper evaluation. This chapter outlines the author's approach to evaluation and management of congenital ptosis.

Evaluation

Pre-operative history and examination are vital because these decide the choice of surgery.

History

It is important to determine whether the condition is congenital or acquired. Photographic records of childhood often reveal important information. Any variation in the amount of ptosis may be significant. A history of any ocular or general association needs to be elicited.

A family history of similar conditions should be determined. Any history of previous surgery or trauma should be recorded. Questions on reactions to previous anaesthesia both by the patient and his relatives need to be asked. Any bleeding tendencies should also be recorded.

Ocular Examination

Visual Acuity

The ocular examination should include a record of best corrected visual acuity to evaluate the presence of amblyopia in the ptotic eye.

Palpebral Aperture

The measurements of palpebral aperture is necessary as difference in palpebral aperture may be used as a measure of ptosis (Fig-1).

The vertical palpebral aperture should also be measured in upgaze, and downgaze. In unilateral cases the difference in the size of palpebral aperture between the two eyes gives the amount of ptosis. In bilateral cases comparison with normal values is necessary. However judging the amount of ptosis by difference in the size of palpebral aperture has

limitations due to possible alterations in the position of lower eyelid. The amount of ptosis may also be accessed by measuring the relation of the lid margin to the light reflex on the cornea (Margin Reflex distance 1 - MRD1). The mean measurement of MRD1 in Indian population is 4.1 ± 0.5 mm.



Fig. 1 : Showing measurement of palpebral aperture in primary gaze.

Amount of ptosis may be classified as:

Mild ptosis	2 mm or less
Moderate ptosis	3 mm
Severe ptosis	4 mm or more.



Fig. 2a : Measurement of LPS action by Berkes Method.



Fig. 2b : Measurement of LPS action by Berkes Method.

Levator action (Fig. 2a-b)

Estimation of levator function is the single most important aspect of ptosis evaluation for surgical planning.

Berke's Method³

Measures the excursion of the upper lid from extreme down gaze to extreme up gaze with action of frontalis muscle blocked (Fig 2A,B). The patient is positioned against a wall while the surgeon's hands press the forehead above the eye-brows ensuring that there is no downward or upward push. The patient is then asked to look at extreme downgaze and then in extreme upgaze and the readings recorded in millimeters. The measurements need to be accurate. The levator action of the two eyes is compared. In our study in a North Indian population levator action in normal eye lids was 13.8 ± 1.0 mm. Crowell Beard reported normal

eye lid excursion to be between 12-17 mm². The levator function is classified as

9 mm or more	-	good
5-7 mm	-	fair
4 mm	-	poor

Putterman's Method⁴

Putterman's method of assessment of levator function measures the margin limbal distance (MLD) in the extreme upgaze

Assessment in Children

Measurement of levator function in small children is a difficult task as no formal evaluation is allowed by the child. The presence of lid fold and increase or decrease on its size on movement of the eyelid gives us a clue to the levator action. Presence of anomalous head posture like the child throwing his head back suggests a poor levator action.

Ilif test

This is another indicator of levator action. It is applicable in first year of life. The upper eyelid of the child is everted as the child looks down. If the levator action is good lid reverts on its own.

Margin Crease Distance (MCD)

Measurement of the margin crease distance (MCD) is the next important step in examination. The MCD is measured when the patient looks down (Fig 3). The height of the crease on the normal side should be measured and compared to the ptotic eyelid. In case of a very faint lid crease it can be made prominent by using a cotton tipped applicator below the lid margin. In some patients, when more than one lid creases are present, the most prominent one should be considered



Fig. 3 : Measurement of margin crease distance while the patient looks down

The distance of the lid crease from the margin is measured as it helps in planning the surgical incision. Also presence of a distant lid fold in a case of moderate to severe ptosis with good levator action indicates a levator aponeurotic dehiscence.

Bell's phenomenon

Confirmation of presence of Bell's phenomenon or upward rotation

of the eyelid on closure of eye is also important as it serves to indicate whether there is a risk of exposure keratitis in the postoperative period (Fig 4).

Corneal sensation

The presence or absence of corneal sensations should also be noted, using a cotton wisp (Fig 5).



Fig. 4 : Eliciting the presence of Bell's phenomenon.



Fig. 5 : The method for testing corneal sensation.

Ocular motility

The extraocular muscle function particularly of the elevator muscles should be recorded (Fig 6A,B).



*Fig. 6 : Congenital ptosis with superior rectus underaction
(a) Primary gaze (b) upward gaze.*

Associations

The presence of jaw winking oculomotor anomalies and blepharophimosis syndrome should be noted. The presence of any other associated ocular anomaly should also be recorded.

Pseudoptosis

Possible causes of pseudoptosis viz. hypophthalmos, enophthalmos, epicanthus, overhanging skin etc. should be excluded.

Neostigmine or Edrophonium (Tensilon) Test

Neostigmine or Edrophonium test is carried out if myasthenia gravis is suspected. In adults 1 mg neostigmine is injected intramuscularly. The ptosis shows a dramatic improvement in 5 to 15 minutes if myasthenia gravis is the cause. Edrophonium is more effective and faster than neostigmine. When used in adults 10 mg of edrophonium is prepared in a tuberculin syringe. The needle is left in situ after 2 mg is injected intravenously over a 15 to 30 seconds period. If no untowards effects are noted within one minute, the remaining 8 mg is slowly injected. If there is no improvement of ptosis in 1 to 5 minutes the patient probably does not have myasthenia gravis. If a cholinergic reaction should occur marked by pallor, excessive perspiration, dizziness, abdominal cramping, lacrimation and such, an injection of 0.5 mg of atropine sulphate is given intravenously.

Phenylephrine test

Phenylephrine 10 percent drops are used in diagnosis of ptosis due to Horner's syndrome and to determine the feasibility of mullerectomy in these cases.

The surgical approach to a patient of ptosis is based on the following factors :

1. Whether the ptosis is unilateral or bilateral
2. Severity of ptosis
3. Levator action
4. Presence of associated problems of ocular motility, blepharophimosis syndrome or jaw winking.

Time of operation for congenital ptosis

It is better to wait till the age of 3-4 years when tissues are sufficiently strong and mature in their development to withstand surgical trauma. The assessment of ptosis and post operative care is also better due to better patient co-operation⁵.

In cases (severe ptosis with poor levator action) where development of amblyopia is a possibility or where (bilateral severe ptosis) the child may develop bad postural habits such as head tilt, brow wrinkling, eye brow arching and odd fascial grimaces which are difficult to eradicate later, the ptosis should be corrected earlier by means of a temporary surgery while a definitive surgery can be performed at a later stage.

Choice of surgical procedure

Restoration of the physiologic function to the best feasible is the

primary concern when selecting a surgical technique to correct ptosis.

The choice of surgical procedure for congenital ptosis depends primarily on two parameters.

1. Amount of ptosis as determined on the basis of MRD.
2. The levator action (Berkes Method)

A number of procedures have been described^{1,6}. The most commonly practiced surgical techniques and the ones practiced by authors are :

1. Fasanella Servat Operation
2. Levator resection
3. Brow suspension ptosis repair

In cases of mild ptosis with a good levator action ($>10\text{mm}$) Fasanella Servat surgery may be the surgery of choice. Some surgeons practice levator resection in these cases but we prefer Fasanella Servat procedure in view of its simplicity and predictability.

In other cases where the levator action is $>4\text{mm}$, levator resection is the procedure of choice. Results of levator resection in this group are extremely poor and even if a good correction is achieved a marked lagophthalmos and lid lag is usually present.

Bilateral Ptosis :

In cases of bilateral ptosis where levator surgery is indicated bilateral surgery at the same sitting is preferred to ensure a similar surgical intervention in the two eyes. However in cases where a gross asymmetry exists between the two eyes the eye with a greater ptosis may be operated first. The other eye is operated at least 6-8 weeks later when the final correction of the operated eye can be assessed.

SURGICAL TECHNIQUES

Fasanella Servat Surgery

The Fasanella Servat operation is a relatively simple procedure which may be undertaken by an occasional ptosis surgeon.

Fasanella Servat described the procedure as an excision of tarsoconjunctiva, mullers and levator palabrae superioris. A number of modifications to the procedure have been described. We use a simple modified technique which avoids the use of haemostat or any special clamp and minimises the complications of the procedure⁷.

Anaesthesia

In adults the surgery can be done under local infiltration anaesthesia

while in children a general anaesthesia is imperative.

The infiltration anaesthesia is given deeper to skin and orbicularis using 2% Xylocaine with adrenaline. 4% Xylocaine drops are instilled in the eye for topical anaesthesia.

Surgical steps

The lid is everted to expose the tarsal plate. Three sutures are passed close to the folded superior margin of the tarsal plate. One suture is passed at the centre and other two at the junctions of middle and outer and middle and inner thirds of the lid (Fig 7a). Three more sutures are placed to emerge close to the margin of the everted lid (Fig 7b) to near the superior fornix in positions corresponding to the first 3 sutures.

Proposed incision is marked on the tarsal plate. The incision is so planned that amount of tarsal plate excised is virtually uniform, decreasing very gradually towards the periphery. This is essential to avoid a central peaking. A groove is made with a blade breaker knife on the marked line of incision (Fig 7d). The incision is completed with a scissors (Fig 7e). The first set of sutures help in holding near the superior fornix emerging close to the lid border and lifting up the tarsal plate for excision.

The second set of sutures help in lifting and supporting the conjunctival and tarsal edges during suturing.

5-0 plain catgut suture is made soft by dipping in saline for 10 minutes and then rolling on the surgeons finger. A continuous suturing is carried out with small knots buried under the edges of the wound (Fig 7f).



Fig. 7a : One set of sutures passed at the superior tarsal border.

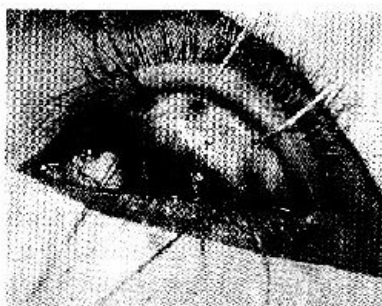


Fig. 7b : A second set of 3 sutures passed near the superior fornix emerging close to the lid border.

Haemostasis is achieved and position of lid margin assessed. Antibiotic is instilled and the eye bandaged.

Post operatively the patient is kept on antibiotics and anti inflammatory agents and cornea observed for any sign of abrasion and treated



Fig. 7c : Proposed incision marked on the tarsal plate.



Fig. 7d : Incision at the proposed site on the tarsus.

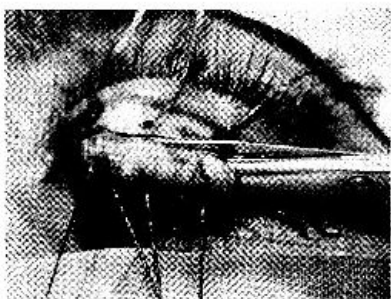


Fig. 7e : Incision completed with the scissors.



Fig. 7f : Continuous suturing being done with 5-0 plain catgut.

effectively where necessary. For severe cases a therapeutic soft lens may be of great help.

Levator Resection

Levator resection is the most commonly practiced surgery for correction for ptosis.

This surgery may be performed by skin or conjunctival approach. We prefer the skin approach as it is more uniformly applicable, provides easy anatomical universally acceptable and creates a good lid fold.

Anaesthesia

In adults local anaesthesia is preferred as it allows on the table assessment, while in children general anaesthesia is necessary.

Surgical Steps

The proposed lid crease is marked on the ptotic eyelid to match the one on the normal side. Considerations is given both to the margin crease distance (MCD) on the normal side as well as the amount of skin show measured in the primary position.

In bilateral ptosis the highest forming crease may be used which is usually at the superior border of the tarsus or the standard measurements of the lid crease in the general population may be used.

Local infiltration is given with 2-3 ml of 2% xylocaine with 1:200000 adrenaline. The injection is also used in patients under general anaesthesia to help in haemostasis.

Three cotton or 4-0 silk sutures are placed through the lid margin to permit downward traction. A lid spatula is placed under the lid. Incision through skin and orbicularis muscle is made along the crease marking (Fig 8a). The inferior skin orbicularis is dissected away from the tarsal plate. The upper edge is grasped and the orbicularis is separated from the orbital septum with its underlying preaponeurotic pad of fat (Fig 8b). Pressure on the globe through the lower lid may help in identification of the orbital septum as the fat can be seen bulging behind it. The orbital septum is cut completely across the lid exposing the preaponeurotic fat. Fat is retracted posteriorly under a retractor exposing the whole tendinous aponeurosis. A little blunt dissection is necessary to expose the aponeurosis.



Fig. 8a : Skin incision in the proposed lid crease

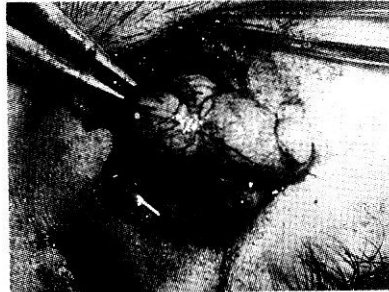


Fig. 8b : Incision of orbital septum, exposing orbital pad of fat.

Three 6-0 traction sutures are passed through the distal end of the aponeurosis at the superior tarsal border taking care not to go full thickness. The fibers of the aponeurosis are cut away from their insertion in the inferior third of the anterior surface of the tarsus. The levator is dissected free from the conjunctiva, mullers by a combination of cutting and blunt dissection. A backward tilt of the lid spatula facilitates the dissection in the desired plane. During dissection care is taken to avoid cutting the fibers attached to the superior fornix in order to prevent a post operative fornix prolapse.

The medial and lateral horns may be cut if a large exposure is desired (Fig 8c,d). The two horns can easily be palpated by stretching the muscle.



Fig. 8c : Levator aponeurosis exposed and separated from the tarsus. Medial horn being cut.



Fig. 8d : Lateral horn being cut.

The direction of the cut should be vertically upwards to avoid damage to the superior oblique medially and the lacrimal gland laterally. The superior transverse ligament of Whitnall can usually be visualised as a whitish fascial condensation running across the junction of the muscular and aponeurotic part of the levator about 15 mm from the insertion. While cutting the horns it is necessary to ensure that Whitnall ligament is not damaged.

Three double armed 5-0 vicryl sutures are passed through the tarsus about 2 mm from the upper border in the centre and at the junctions of central third with medial and lateral thirds. The sutures are then placed in the levator at a predetermined position (Fig 8e) based on the preassessment and slip knots tied. The patient is asked to look straight, if under local anaesthesia or the eye is brought to primary position using a fixation forceps if the patient is under general anaesthesia.



Fig. 8e : Three 5-0 vicryl sutures passed through the tarsus and through the desired position in the levator muscle.



Fig. 8f : Sutures from tarsus tied on the levator aponeurosis, after ensuring adequate correction and appropriate contour. Excess aponeurosis is excised.

The lid level and contours are evaluated. We decide the amount of levator to be resected intraoperatively. The eye lid is left at the

predetermined position in relation to the limbus based on the preoperative levator action. We use a modification of Berkes criteria based on our post operative observation⁸.

The position of the lid aimed at during the on table assessment should be as follows :

Levator Action	Recommended Placement of lid
2-4 mm	1mm above the limbus (when levator resection is chosen to be undertaken)
5-7 mm	1mm below the limbus
8mm or more	2mm below the limbus

The desired modifications to achieve the desired level and the contour of the lid are made and the sutures finally secured (Fig 8f).

The excess levator is then excised. If the skin is deemed to be in excess by careful evaluation a strip of skin is removed from above the lid crease (Fig 8g). A piece of orbicularis inferior to the lid crease may close be excised to decrease the bulk of the eyelid. Four to 5 lid fold forming



Fig. 8g : The excess of skin is excised.

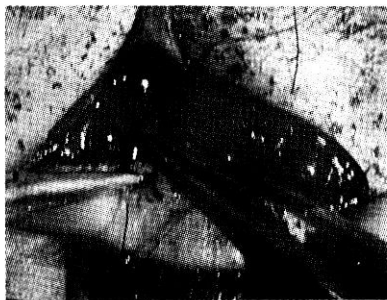


Fig. 8h : 6-0 silk sutures are passed for skin closure taking a bite through the stump of resected levator aponeurosis to create a lid fold.



Fig. 8i : Skin closure is complete.



Fig. 8j : An inverse frost suture is passed.

sutures are placed. The sutures pass through the skin edges taking a bite through the cut edge of the levator (Fig 8h). These sutures invaginate the skin to form an attachment to the levator. More sutures may be placed to appose the skin edges.

An inverse frost 6-0 suture is passed through the lower lid margin over a bolster (Fig 8i). The suture is tucked to the forehead to close the eye after an antibiotic ointment has been instilled.

Post-operative Followup

A close postoperative follow up is done in all cases. Patients are given oral antibiotics and antiinflammatory agents. The bandage is opened on the first post operative day. The cornea is monitored for signs of exposure keratopathy. The frost suture is removed on the first or second post operative day. The results of the procedure are usually gratifying (Fig 9a,b,c,d).



Fig. 9a



Fig. 9b



Fig. 9c



Fig. 9d

Fig. 9 : Pre and Post operative photographs of a patient with congenital ptosis after levator resection. (a) Pre-operative (b) Post-operative primary gaze (c) Post-operative looking up (d) Post-operative looking down

Brow Suspension Repair

Brow suspension is the procedure of choice in congenital simple

ptosis with a levator action of less than 4 mm. A number of materials viz non absorbable sutures, skin clips, muscle strips, banked or fresh fascia lata strips have been used for suspension. We prefer prolene sutures for temporary thread sling procedure and fresh autogenous fascia lata for permanent brow suspension. Our experience with mersilene mesh has been unsatisfactory with a high rate of sterile abscess formation and removal⁶.

Thread sling

Thread sling is carried out in very young children with severe ptosis where prevention of amblyopia and uncovering of the pupil is the main aim^{2,7} (Fig 10a,b). We use 4-0 prolene or CVO IPTFE (Gore tex) Sutures



Fig. 10a



Fig. 10b

Fig. 10 : Correction of ptosis in infants by thread sling (a) Pre-operative (b) Post-operative

(Fig 11) by modified Crawford technique for the brow suspension. This procedure may have a high recurrence rate of upto 20 to 30 per cent, or may show formation of a suture granuloma.

Definitive surgery may be performed at a later date when a fascia lata sling is done.

Fascia lata sling surgery

In children above three years of age with severe congenital simple ptosis and a levator action of less than 4mm fascia lata sling is the procedure of choice⁶

We prefer fresh autogenous fascia lata for suspension. Even in case of unilateral severe ptosis a bilateral fascia lata sling surgery is preferred as unilateral surgery leads to a marked asymmetry in down gaze and results of bilateral surgery are more acceptable.

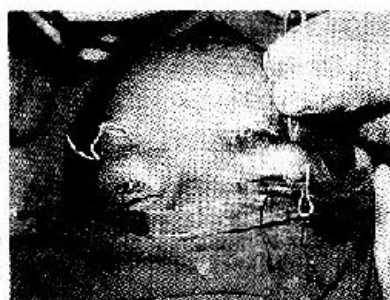


Fig. 11 : Goretex (ePTFE) cv-o suture for correction of severe congenital ptosis.

Anaesthesia

All cases are done under general anaesthesia. Infiltration with 2% xylocaine with 1:200000 adrenaline is done in the eyelid and eye brows and in the thigh at the proposed site of incision.

Obtaining Autogenous Fascia Lata

A 11 cm × 1.5 cm strip of fascia is removed and is divided into 4 strips each 3-4 mm wide.

Surgical Technique

a) Removal of fascia Lata (Fig 12a)

After cleaning and draping the thigh a line is marked joining the head of fibula and the anterior superior iliac spine. A 4-5cm incision is made along the line starting 6-8 cm above the knee joint. The skin incision is deepened through fat till the glistening white fascia is seen which is then cleared of fat for a length of 10 cm. Two incisions about 1.5 cm apart are then made on the exposed fascia. The incision is extended upwards using a long scissors in a length of about 11 cm. The upper end of the strip can be cut by a long curved knife or a Crawford stripper may be used.

The fascia is then removed and kept in a bowl containing Ringer lactate with 1cc of gentamycin.

Meticulous subcutaneous closure is completed with 4-0 chromic catgut sutures. Skin is closed with 3-0 or 4-0 silk interrupted sutures.

The fascia is divided into 4 strips 3-3.5 mm wide strips by fixing it on a wooden board and incising with a scalpel blade.

(B) Placing of the Fascia Lata Strips

Traction sutures are passed through the eyelid dividing it into thirds along its horizontal width.

Four small incisions are made 3-4 mm from the lid border depending upon the desired position of the eyelid fold. The two central markings are made on either side of the centre of eyelid a third one just inner to the junction of middle and middle third while the outer one is just outer to the junction lateral and middle thirds.

The eye brow incisions are marked next. The eye lids are placed in the position of desired correction. The outer mark is made at the intersection of the lines perpendicular to the two outer eyelid marks while the inner one is made at the intersection of perpendiculars to the two inner eyelid incisions. A third eyebrow incision is made between the two incisions and 3-4 mm higher.

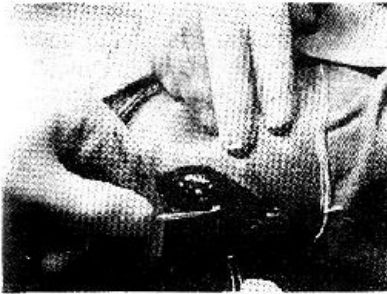


Fig. 12a : Fascia lata strip being removed from the thigh

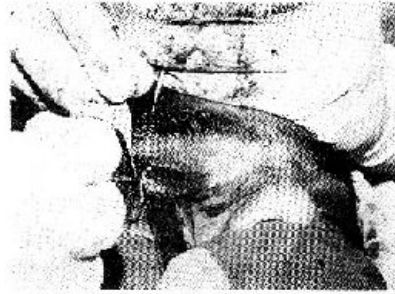


Fig. 12b : Fascia lata strip being passed from the two outer eyelid incisions using a Wright's fascia lata needle.



Fig. 12c : Both fascia lata strips passed in a double triangle fashion.



Fig. 12d : Fascia lata strips pulled up and tied to achieve desired correction and contour.

The eyelid incisions are made down to tarsus with a Bard Parker knife. The eye brow incisions are made down to the frontalis muscle starting with temporal incisions making the nasal incisions last in order to avoid difficulty in visualisation due to bleeding. Undermining is carried out from a small distance below the eyebrow incisions to prepare a pocket for placing the fascial knots.

One fascia lata strip is passed through the two outer eyelid incisions using a forceps.

The two ends of the strip are then passed to the outer eyebrow incisions using a Wrights fascia lata needle (Fig 12b).

The needle is passed in the submuscular plain from the lateral brow incision to emerge from the lateral incision in the lid. The fascia is threaded through the eye of the needle and is pulled through. The Wrights needle is again passed from the lateral incision to the second eyelid incision threaded with fascia and drawn up. The procedure is repeated on the medial side (Fig 12c).

The fascial strips are pulled up and a single tie made so as to pull the eyelids 2-3 mm above the desired position as the lids will fall down when the knots are buried (Fig 12d). After a single tie to both medial and lateral strips the position and contour of the eyelid are assessed. Any required adjustments are made. Presence of a good lid crease is ensured at this stage. The knots can then be secured with a 5 0 vicryl suture. A second tie is made and secured.

One end of each fascial strip from each brow incision is pulled through the central brow incision using a Wrights needle. Knot is tied and secured similarly. All the knots are buried in the pockets prepared for them.

The excess of skin created by shortening of the posterior lamina is judged and excised by removing a spindle of skin from the eyelid crease by careful skin incision making sure that fascial strips are not damaged. This is facilitated by making an eyelid crease incision before the fascial knots are tied. The eyelid crease incision is closed with 6 0 silk sutures and eyebrow incisions with 4 0 silk suture. The marginal incisions required no closure.

Post Operative Care

A close post operative follow up is required in all cases Patients are given oral antibiotics and anti inflammatory agents. The bandage is opened on the first post operative day and the eye left open. The need for retention of the frost suture is assessed based on the extent of the lagophthalmos and careful monitoring of cornea for signs of exposure keratopathy. The frost suture may be removed when deemed unnecessary. The thigh sutures are removed after 10-14 days.

An appropriate selection and meticulous execution of surgical technique hold the key to obtaining excellent functional and cosmetic results in patients with ptosis.

MANAGEMENT OF COMPLICATED PTOSIS

The common associations of congenital ptosis are

1. Blepharophimosis syndrome
2. Marcus Gunn ptosis
3. Ptosis associated with oculomotor anomalies.

In a series of 100 cases of congenital ptosis presenting to the authors over a period of 1 year blepharophimosis syndrome constituted 7 per cent, Marcus Gunn ptosis was noted in 18 percent, while superior rectus restriction and double elevator palsy were seen in 3 per cent and 1 percent cases respectively².

Management of Blepharophimosis Syndrome

The blepharophimosis syndrome consists of ptosis, epicanthus inversus, telecanthus, horizontal shortening of palpebral aperture, flattened supraorbital ridges, arching of the eyebrow and lateral ectropion of the lower eyelid.

The management of blepharophimosis syndrome is carried out in two stages. The first stage involved correction of epicanthus, telecanthus with horizontal lengthening of the palpebral aperture. The second stage performed 6 months later comprises correction of ptosis.



Fig. 13: Photograph showing a patient of blepharophimosis flattened supraorbital ridges. Arching of eyebrow.

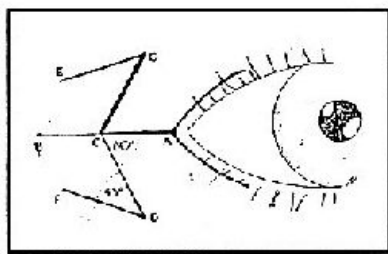


Fig. 14: Line sketch demonstrating marking for double Z (Mustarde's) plasty for correction of epicanthus.

Stage 1

Correction of Epicanthal Fold and Telecanthus

A number of procedures viz. Blair, Spaeth, Y-V plasty and Mustarde's double Z plasty have been described for the correction of epicanthus¹⁰.

We prefer Mustarde's double Z plasty for correction of the epicanthal fold along with transnasal stainless steel wiring for the correction of telecanthus.

Anaesthesia

All the cases are performed under general anaesthesia. Local infiltration with xylocaine and 1:200000 adrenaline is used for haemostasis.

Double Z Plasty

The markings are made as follows (Fig 14). The first mark is made just medial to the medial canthus (A). The proposed canthal site (B) is marked so as to make the intermedial canthal distance half that of the interpupillary distance. The two marks are joined. All the subsequent lines drawn are 2 mm smaller than the line AB. Two lines are drawn from point A parallel to the upper and lower lid margins (AF). From the centre

point of AB(C), a line is drawn medially at 60° both above and below (CD). Another line is drawn outwards at an angle of 45° from the point of D(DE).

A lateral canthotomy and canthoplasty is carried out as described later, before the skin incisions begin.

The incisions are made through the skin down to the orbicularis. The flaps are undermined and retracted. The site of proposed canthus is cleared of all tissue upto the periosteum and the medial palpebral ligament (MPL) identified (Fig 15a). The periosteum is incised medial to the insertion of MPL and is reflected along with the lacrimal sac.



Fig. 15a : Trans nasal wiring for correction of telecanthus medial palpebral ligament (MPL) dissected for transnasal wiring.

A large bony opening 12-15 mm high and 10-12 mm wide is made as for dacryocystorhinostomy but located more posterior and superior. The edges of the bony opening are smoothed. A similar procedure is performed on the opposite side.

MPL of one side is wired with a 24G stainless steel wire in a mattress fashion close to its attachment to the tarsus and the two ends of the wire passed to the opposite side through the bony opening with the aid of an aneurysm needle or a Wright's fascia lata needle (Fig 15b). The wire is threaded on to the other MPL with a similar double bite. The two ends are tightened and a single twist given to the wires (Fig 15c). The position of the two medial canthi is assessed by looking from in front, above, and the sides. Once the desired position is obtained the wire is twisted several times and the ends cut. The wire ends are pushed backwards into the bony opening. Haemostasis is achieved and the incision closed in layers.



Fig. 15b : Stainless steel wire being passed through the bony opening to the opposite site.



Fig. 15c : Stainless steel wire being tightened to observe the new position of the canthi.

The skin flap may need to be trimmed slightly before they are transposed and sutured with 6-0 silk. Some soft tissue under the flap is excised to remove excess.

Lateral canthoplasty

The lateral canthus is crushed by a straight haemostat for a few seconds. A lateral canthotomy is performed. The bulbar conjunctiva at the lateral canthus is undermined. The apex of the conjunctiva is sutured to the proposed new position of the canthus which is generally somewhat short of the end of the skin incision. The skin edges distal to the new lateral canthus are apposed with 6-0 silk sutures. The conjunctiva and skin are also sutured with 6-0 sutures.

A similar procedure is repeated on the other side.

Follow up :

The bandage is removed after 24 hours and suture removal completed after 5-7 days. The results are gratifying (Fig 16a, b, c).



Fig. 16 : Pre and Post operative pictures of transnasal wiring (a) Pre-operative (b) Early Post-operative - front view, showing correction of telecanthus (c) Early Post-operative oblique view showing depth of the new medial canthus.

Stage II

The second stage procedure is performed 6 months after the primary surgery. A bilateral fascia lata sling procedure is undertaken. The technique as followed by the authors has been described in part II of the series (17a-d).

Marcus Gunn Ptosis

Patients with jaw winking phenomenon or Marcus Gunn ptosis have ptosis associated with lid retraction on opening the jaw or its movement to the opposite side (classical Marcus Gunn phenomenon). An inverse Marcus Gunn phenomenon is also known.

Management of these cases depends on whether the jaw winking is cosmetically significant. Where jaw winking is not significant the choice of procedure is based on the amount of ptosis and the levator action as for any case of congenital simple ptosis. However if levator resection is carried out, a larger resection is necessary and undercorrection is



Fig. 17a



Fig. 17b



Fig. 17c



Fig. 17d

Fig. 17 : Pre-operative and Post-operative photographs of a patient of blepharophimosis syndrome. (a) Pre-operative (b) Early Post-operative following transnasal wiring (c) Late Post-operative (6 months) after transnasal wiring (d) Post-operative following bilateral fascia lata sling surgery.

common. The jaw winking often becomes more prominent after a levator surgery as the movement now starts from a higher lid position and scleral show may be more obvious. In cases with significant jaw winking bilateral levator excision with a fascia lata sling surgery is the procedure of choice."¹

Anaesthesia

All cases are performed under general anaesthesia. Local infiltration using Xylocaine with 1:200000 adrenaline is used for haemostasis.

Levator excision with Fascia Lata Sling

The eyelid and brow are marked as for frontalis sling surgery.

A skin incision is made at the proposed site of lid crease. The skin incision is deepened through the orbicularis. Dissection is carried superiorly deeper to the orbicularis and the orbital septum is identified. The orbital septum is cut along its entire length and the preseptal pad of fat is freed. Three traction sutures are passed through the distal part of levator aponeurosis and the levator disinserted from the superior border of tarsus. The aponeurosis is also dissected from the underlying conjunctiva. The medial and the lateral horns are felt and cut. An 8 to 10 mm strip of distal levator aponeurosis is excised. Care is taken not to carry out any dissection inferior to the incision to maintain normal tissue



Fig. 18a : Pre-operative photograph, in the primary gaze showing ptosis in the left eye.



Fig. 18b : Photograph showing retraction of the left eyelid on moving the jaw in the right side



Fig. 18c: Photograph showing retraction of the right eyelid on moving the jaw to the left side.



Fig 18d : Excision of the levator on the right side.



Fig. 18e : Post-operative photograph of the patient in primary position.



Fig. 18f : Post-operative photograph in upward gaze.



Fig. 18g : Post-operative photograph in downward gaze.



Fig. 18h: Post-operative photograph of the patient showing absence of jaw winking.

Fig. 18(a-h) : Pre and Post operative photographs of a patient with bilateral jaw winking following bilateral levator excision with fascia loto sling

planes. A similar procedure is carried out on the opposite side. A fascia lata strip is harvested from the thigh and a fascia lata sling surgery is carried out by the standard modified Crawford technique discussed earlier.

Follow up :

The bandage is opened after 24 hours. The patient is monitored closely for any sign of exposure keratopathy and the Frost suture may be removed after 48-72 hours if no keratopathy is present. Skin sutures are removed after 7 days. The thigh sutures are removed after 10-14 days. The results of the surgical procedure are shown in Figs. 18 a-h

Ptosis Associated with ocular motor abnormalities

It is necessary to correct the ocular motility problem before correction of ptosis. This is necessary for two reasons.

1. Superior restriction of motility and accompanying hypotropia is often associated with an element of pseudo ptosis making the assessment and correction of ptosis difficult.

2. The hypotropic eye with poor Bell's phenomenon is extremely vulnerable to exposure keratopathy due to post operative lagophthalmos.

Congenital Ptosis with superior rectus weakness

Superior rectus weakness is a common association with congenital ptosis, as the two muscles develop from the same myotome. The weakness is considered to be myogenic rather than neurogenic. The hypotropia is corrected by surgery on the inferior rectus muscle before ptosis correction is carried out.

Results of levator resection are less effective necessitating larger resections. If the eyes are at the same level in primary position a 3-4 mm larger resection has been recommended. The other recommended procedure is levator excision on the normal side followed by a bilateral fascia lata sling surgery.^{1,12}

Ptosis associated with double elevator palsy

Management of this condition requires a preliminary correction of the associated hypotropia.

The surgical procedure of choice for this condition is transposition of the medial and lateral rectus to the insertion of the superior rectus. (Knapp's Procedure)(Fig.19a-f).

Three months after the Knapps procedure ptosis correction is performed by the standard techniques.



Fig 19a: Pre-operative photographs of a case of congenital ptosis with double elevator palsy in left eye. In primary position



Fig 19b: Photograph showing restriction of levoelevation in the left eye (superior rectus under action).



Fig. 19c: Photograph showing restriction of dextroelevation (inferior oblique under action).



Fig. 19d: Post-operative photograph of the patient showing correction of hypotropia following Knapp's procedure.



Fig. 19e: Post-operative photograph showing improvement in dextroelevation.



Fig. 19f: Post-operative photograph showing improvement in levoelevation.

Fig. 19(a-f): Pre and Post operative photographs of a patient with double elevator palsy following Knapp's procedure.

Misdirected 3rd nerve ptosis

It is of very rare occurrence because of the variation of deviation in different fields of gaze it is usually treated conservatively.

In cases where surgical treatment is imperative a levator excision with bilateral fascia lata sling is the procedure of choice.

Ptosis associated with third nerve palsy

These patients are very difficult to manage as the Bell's phenomenon is absent and they often have a total ptosis with no levator action. A sling

surgery carries a very high risk of exposure keratopathy. A conservative sling surgery with partial correction for functional purpose may be performed. In other cases a crutch glass, where it is well tolerated, may be a visible alternative.

References

1. Beard C : Ptosis, 3rd edition, St. Louis : *C.V. Mosby Company* 1981.
2. Grover AK and Mittal Sanjay, A clinico - pathological study of levator muscle for Congenital Ptosis Thesis is submitted to Delhi University.
3. Crawford JS (1987) : Congenital Blepharoptosis' in Byron C. Smith Ophthalmic plastic and reconstructive surgery, vol 1, *C.V. Mosby company* : 631-653.
4. Puttlerman (1980) : Basis oculoplastic surgery in Peyman GA : Principles and practice of ophthalmology, Vol 3. *Philadelphia : WB saunders Company*, 2246-2333.
5. Crawford JS : 1987 "Congenital Blepharoptosis" in Bryon C Smith - Ophthalmic Plastic and reconstructive Surgery. Vol. 1 *CV Mosby Company*, 631-53.
6. Smith B : Mc Cord CD : 1969 Baylis H : *Am J Ophthalmol.* 68 :92.
7. Betharia SM, Grover AK and Kalra BR : 1983 *Br J. Ophthalmol.* 67, 58-60.
8. Grover AK, K Uma Chaturvedi Sanjal Mittal 1995 : Presented at 53 AIOS Annual Conference at Bombay.
9. Grover AK, Gupta AK 1992. Proceedings of the Golden Jubilee Conference of All India Ophthalmolog Society New Delhi : 54-56
10. Mustarde JC : Epicanthus and telecantus. *Int. Ophthalmol clin.* 4:1964.
11. Gunn RM : 1983. *Trans Ophthal. Soc. UK.* 3:283.
12. Berke RN : Types of operation for congenital and acquired ptosis - In Traoutman R. Converse J and Smith B (Editors) : *In Plastic and reconstructive Surgery of the eye and adenexa. Washington, DC Butterworths*, 1962.

BASIC PRINCIPLES OF EYELID RECONSTRUCTION

DR. V.P. GUPTA

Introduction

Eyelid reconstruction consists of repair of eyelid defects which includes repair of lid colobomas, reconstruction of medial and lateral canthus, periorbital reconstruction etc. Although smaller lid defects may be repaired by general ophthalmologists, lid reconstruction is very challenging requiring great experience and expertise. In view of the unique structure and function of the eyelids even smaller defects may require complex methods of lid reconstruction. Lid defects/colobomas may be congenital or acquired. Various causes of acquired lid colobomas include traumatic tissue loss, surgical resection of tumour, burns, irradiation, entropion, herpes zoster ophthalmicus, etc. Although traumatic lid defects require lid reconstruction most often. The congenital lid colobomas and colobomas secondary to tumour resection pose special problems.

Evaluation of lid defects

Proper evaluation of lid defects is very important. Evaluation of coloboma would help in accurate planning of lid reconstructive procedure. Various factors which govern the choice of procedure includes the following^{1,2} :

1. The eyelid involved : Upper, Lower
2. Depth of the defects : Superficial, full thickness
3. Lid margin defects, Non-lid margin defects
4. Size of the defects - 25%, 30%, 40%, 50%, 60%, 75%, or 100%
5. Shape of the defect - vertical, horizontal, irregular, pentagon etc
6. Location - lateral, medial, central
7. Involvement of medial/lateral canthus
8. Elasticity/stretchability of lids
9. Age of patient
10. Condition of the opposing eyelid & condition of contralateral eyelids.
11. Levator muscle, lacrimal apparatus involved or not
12. Availability of adjacent or distant tissues for repair

13. Condition of conjunctiva & fornix
14. Etiology of the defect

Goals of lid reconstruction

1. To restore physiologic functioning of the eyelids with respect to vision, lid closure, mobility & tear drainage.
2. To re-establish anatomic integrity.
3. To provide best Cosmetic appearance

Fulfilment of the above goals in lid reconstruction is often difficult and may involve complicated multi-stage operations. Any adequate lid reconstruction should restore the anatomic structures of the eyelid. It should provide the anterior skin - muscle lamina with a thin skin particularly for the upperlid a cartilagenous frame work and a mucous membrane lining posteriorly. If possible attempt should be made to provide a mucocutaneous lid margin with intact cilia. Adequate attention should be paid to reconstruct the medial and lateral canthal tendons and the canthi.

Non-Marginal Lid Defects

The important points to be kept in mind while repairing non-marginal lid defects are ^{1,2}

1. Smaller defects can be sutured without any undermining.
2. The round defect should be converted into an elliptical shape.
3. There should be no tension or vertical pulling effect on the lid margins. All vertical tension on the eyelid margins should be eliminated by generous undermining of wound edge.
4. All incisions should preferably be parallel to lines of tension & eyelid margin. However, in case of lower eyelid, this may result in ectropion or scleral show. Therefore, one should try to convert the defects so that the orientation of the wound becomes perpendicular to the lower lid margin.
5. The defect should be sutured in 3 layers.
6. For larger defects where direct closure is not possible, despite maximum undermining local skin flaps or skin grafts are indicated.

Full thickness Lid Margin Defects

1. **One Fourth of Lid Defect (25%)**
upto 25% of lid defect in younger individuals who possess comparatively tighter lids can be repaired by primary layered

closure (direct layered closure). Direct layered closure can be employed to repair even 30 - 40% lid defect in older individuals or in patients with hypertrophic eyelids due to excessive lid laxity or stretchability^{1,2,3}.

2. Half of the lid Defect (50%)

Various procedures which can be utilised to repair such defects are as follows^{1,2} :-

- (i) Direct suturing with lid lengthening procedure such as lateral canthotomy and lateral cantholysis.
- (ii) Lateral semicircular rotation flap (Tenzel's)
- (iii) Tarsoconjunctival flap - Horizontal (Hewes) Tarsoconjunctival transposition flap
- (iv) Composite lid graft (Callahan)
- (v) Marginal pedicle rotation flap (Mustarde)
- (vi) Free tarsoconjunctival graft
- (vii) Tarsoconjunctival advancement flap (Heghes)

3. 60% To 100% Lid Defect

- (i) Bridged advancement flap (Cutler Beard procedure)
- (ii) Tarsoconjunctival advancement flap (Heghes)
- (iii) Cheek rotation flap (Mustarde)
- (iv) Free tarsconjunctival graft and myocutaneous advancement flap

4. Total Loss of Upper Lid

- (i) Mustarde's switch flap for reconstruction of total loss of upper lid.
- (ii) Transposition cheek flap
- (iii) Temporal forehead Transposition flap (Fricke)

Posterior lamellar graft is necessary for lining of these flaps

5. Total Loss of upper lid and Partial loss of lower lid

Reconstruction is based on whether the residual part of lower lid is present laterally or medially³. If the total loss of upperlid is associated with presence of lateral part of lower lid, this lateral part of lower lid is used as a switch flap for the upperlid (Mustarde's operation). The remaining part of the upperlid is reconstructed by suturing the temporal frontal pedicle flap lined by mucous membrane. However, in patients with the residual

lower lid located medially, this need not be transferred to upperlid. The remaining lower lid is formed by cheek rotation flap lined by mucous membrane. The reconstruction of upperlid is difficult in such cases. It may be reconstructed with the help of a supraorbital/forehead flap lined by mucous membrane.

6. Absence of both the lids with intact eye ball

In such cases protection of the cornea should be undertaken on an emergency basis. If remnants of conjunctiva are present in the superior & inferior fornix, it can be dissected and sutured together to cover the cornea. If conjunctiva at the fornices is not available free mucosal graft is placed. Periorbital skin flaps for upper & lower lid area are raised to cover the conjunctiva/mucosa. Auricular cartilage or scleral graft may be placed underneath the skin flap. Periorbital orbicularis muscle bridge pedicles are mobilised and sutured between the cartilage & skin³.

Basic Differences in the reconstruction of upper and lower eyelids

Upper Eyelid Reconstruction

1. More important than lower due to cornea exposure.
2. Should be done on priority if both lids are missing
3. Upper lid reconstruction is preferred at the cost of lower lid
4. Incisions should be parallel to the lines of tension & lid margin
5. Gravitational effect and lid laxity do not cause adverse effects

Lower eyelid Reconstruction

- Less important so far as corneal protection is concerned
- Can wait
- Lower lid reconstruction utilizing upperlid can be done
- Wound orientation parallel to lines of tension and lid margin would result in scleral show or even ectropion. Hence wound should be converted perpendicular to lid margin.
- These may cause adverse effects like ectropion, retraction, scleral show.
- Vertical suspension, lid stability

	and canthal tendon support play vital role
	Excessive horizontal tension less critical, so comparatively larger defects may be sutured by primary closure.
6. Thinner skin	Thicker than upperlid skin
7. Height of tarsus 8-9 mm	Height of tarsus 5 mm
8. Less important for tear drainage	More important for tear drainage

Techniques for upper eyelid reconstruction

1. Direct closure
2. Tenzel's lateral semicircular rotation flap
3. Cutler - Beard's bridge flap
4. Tarsconjunctival flap
5. Free tarsconjunctival graft⁴
6. Mustarde's marginal pedicle rotation flap
7. Composite eyelid graft
8. Local myocutaneous flap with posterior lamellar graft
9. Periorbital flaps with posterior lamellar grafts

Techniques for lower eyelid reconstruction

1. Direct Closure
2. Lateral semicircular rotation flap
3. Reverse Cutler - Beard's operation
4. Free tarsconjunctival graft with myocutaneous advancement flap
5. Hugh's tarsconjunctival advancement flap
6. Mustarde's cheek rotation flap
7. Temporal forehead flap with posterior lamellar grafts
8. Composite eyelid graft

Basic Principles of oculoplastic surgery in Relation to Lid Reconstruction

Anaesthesia :- Oculoplastic surgeries in children are performed under general anaesthesia (GA). Even in adults GA is preferred if the

surgery is expected to be time consuming. GA is particularly useful if it involves harvesting of graft from distant sites e.g. mucous membrane graft, skin graft, nasal, palatal and auricular cartilage surgical procedures of shorter duration in adults may be performed under local anaesthesia (LA). Disadvantages of LA are systemic side effects, toxic effects in patients requiring major reconstructive procedures, and tissue distortion. Local infiltration in the eyelids is done between the tarsal plate and orbicularis oculi.

Placement of Incisions

Generally incisions should be parallel to the wrinkle lines (lines of facial expression) so that scars are not cosmetically unsightly e.g. horizontal incision in forehead, vertical incision for glabellar flap, oblique incision in the cheek and the lateral canthal region⁵⁻⁷.

However, maximum extensibility is perpendicular to the wrinkles⁵⁻⁷. Place the incision in the inferior part first. Skin should be taut while making incision. Knife should be perpendicular to the skin surface, otherwise bevelled incision results which produces ugly scar. While making the incision suction of blood prevents obstruction of surgical field. Hemostasis must be perfect⁵⁻⁷. It is achieved by pressure with cotton swabs dipped in cold saline, adrenaline soaked gauze pieces, clamping the bleeding vessel with haemostats, bipolar cautery etc.

Instruments, Needles and Suture Materials

The instruments required include gentian violet paint/marketing pen, Bard Parker blade No. 11 fitted into No 6 handle, plain forceps, straight & curved conjunctival scissors, Westcott spring scissors, tenotomy scissors, fine hooks for skin retraction (Kilner/Gillies hooks), claw retractors, Desmarre's retractor, fine tissue forceps, tooth forceps, lid spatula, Castroviejo needle holder, straight and curved artery forceps, bipolar and unipolar cautery, suction, etc. Fine atraumatic needles increase the ease & smoothness of the surgery, do not cause tissue trauma and produce a fine scar. Cutting needles are required for deep suturing and periosteal fixation. Spatula needles are excellent for lid margin suturing & tarsal plate suturing. Skin closure should be done with taper cut or reverse cutting needles.

Suture materials required for lid reconstruction are non absorbable & absorbable. Non absorbable suture materials commonly needed are 4.5 & 6-0 braided silk, 4, 5, 6-0 prolene & nylon mono-filament. Absorbable sutures often used include plain catgut, chromic catgut, dextron, vicryl and monocril. 5-0, 6-0 & 7-0 vicryl with spatula needles are excellent absorbable sutures.

Suturing techniques

Following precautions should be employed while closing the wounds⁵⁷ :-

- (i) Ensure complete hemostasis, remove all blood clots.
- (ii) Eliminate all tension from the wound edges by adequate undermining.
- (iii) There should be no dead space. Dead space is often produced in extensive bone deep dissections during resection of Basal cell carcinoma in the medial canthal region.
- (iv) Meticulous wound closure in layers. Adequate closure of deeper tissues using inverted mattress suture.
- (v) There should be no overlapping of wound edges, rather ensure eversion of the wound edges.
- (vi) The suturing techniques have been illustrated in the chapter on basic principles.

Free Grafts in Lid Reconstruction

Free grafts are required when extensive tissue defects are produced after resection of tumours which cannot be repaired by direct suturing or with flaps.

(i) Free Graft for Anterior Lamella

Full thickness skin graft and split skin graft replace the anterior lamella of the eyelid. The donor sites for free skin grafts are upperlid skin from the fellow eye, post auricular, supraclavicular, medial side of arm, groin and nasolabial fold. Although the skin from the contralateral upper eyelid is the best match, however, adequate size can only be obtained in senile individuals with excessively lax upper lid skin.

(ii) Free Grafts for posterior lamella

Posterior lamella of the eyelid is made up of two components (i) the tarsal plate which provides the internal stability to the eye lid and (ii) conjunctival lining.

A variety of free tissue grafts have been used to replace the posterior lamella. These grafts provide replacement for the tarsus, conjunctiva or both.

Following free grafts are available to replace posterior lamella :

1. Free conjunctival autograft from the contralateral eye
2. Free tarsoconjunctival graft

3. Oral mucosa
4. Scleral graft
5. Fascia lata (autogenous/homologous)
6. Composite eyelid graft
7. Palatal mucoperichondrium
8. Nasal mucoperichondrium
9. Auricular cartilage

Commonly used surgical techniques

Direct Layered closure (Primary closure) of full thickness marginal defects

This technique consists of direct suturing of full thickness lid margin defects. This procedure is best suited for 20 to 30% lid defect in young patients and 30 to 40% defect in senile individuals with excessive laxity of lids. It may be possible to close even slightly larger defects than the above mentioned limits if closure is combined with lateral canthotomy and cantholysis (lid lengthening procedures).

The defect is converted into a vertical pentagon with vertical sides

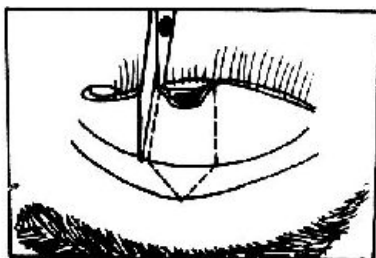


Fig. 1 : Convert the lid coloboma into a vertical pentagon.

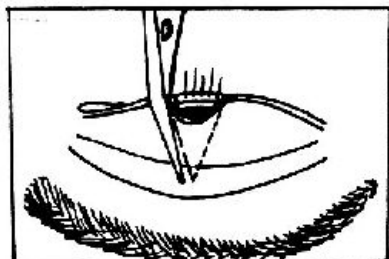


Fig. 2 : Wrong technique - Do not convert the lid defect into a triangular defect.

extending the full vertical height of tarsus and the connecting arms converge at the corresponding fornix^{1,2}. (Fig.1,2)

6-0 vicryl sutures with atraumatic spatula needle is used for suturing. Vertical mattress sutures are the most important sutures in this technique. (Fig.3) Vertical mattress sutures are passed at gray line, posterior lid margin (tarsosconjunctiva) and anterior lid margin. If it is difficult to pass 3 such sutures only one or two may serve the purpose.

Initial bite of the suture is placed at the gray line about 3 mm from the cut end. This is the deep bite of the vertical mattress suture. The

deep bite should be at the same depth from the lid margin on both sides. The needles emerges at the same distance from the cut end i.e. 3 mm. The return bite is placed 1 to 1.5 mm from the cut end and it emerges at the same distance on the opposite side. On tying the suture one should achieve eversion or out pouting of wound edges. There should be no tension on wound edges. In case of excessive tension on wound edges, lateral canthotomy and cantholysis of corresponding crus of lateral canthal tendon should be performed. Lateral cantholysis is also indicated if it is intended close larger than 1/3rd defect by direct closure. The ends of the gray line & posterior lid margin sutures should be left longer. These long ends are then included in the knot of anterior lid margin suture. This additional step avoids constant rubbing of cornea by the suture ends. Now, vertical cut edges of tarsal plate are sutured with 7-0 vicryl sutures(Fig.4). Partial thickness bites are taken from the tarsal plate. Orbicularis oculi and skin are sutured in separate layers using 7-0 vicryl.

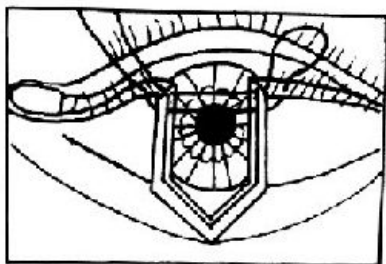


Fig. 3 : Pass a vertical mattress suture of 6-0 vicryl at gray line.

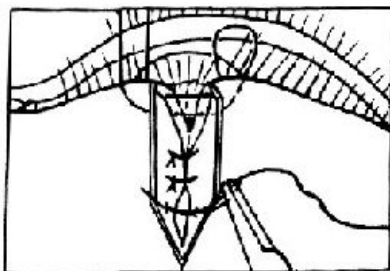
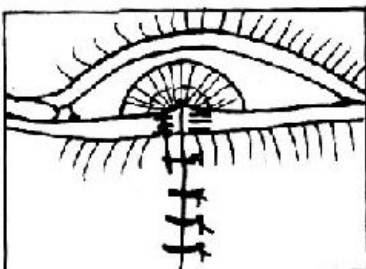


Fig. 4 : Suturing of vertical edges of tarsal plate with 6-0 vicryl.

Inverse Frost suture at the suture line may be necessary in some patients having a tendency for retraction of lid margin resulting in lid notch. This inverse frost suture provides downward traction on the sutured tissues in the early postoperative period and prevents retraction/lid notch formation².



At the end of the operation the sutured eyelid may appear very tight and ptotic(Fig.5). This tightness and ptotic appearance disappears gradually as the tissues relax in due course of time.

Fig. 5 : 3 vertical mattress sutures at lid margin result in everted wound edges. Skin closed with 6-0 silk.

Advantages

- (i) This is the simplest and one of the best methods which provides

lid margin with intact cilia.

- (ii) Excellent lid stability due to direct suturing of tarsus.
- (iii) Single stage procedure
- (iv) This is the most important technique which is not only useful in repair of lid colobomas but also for repair of lid lacerations.
- (v) Direct closure is a part and parcel of other techniques of lid reconstruction e.g. Tenzel's flap, marginal pedicle rotation flap (Mustarde) etc.

Cutler Beard procedure (Bridged Flap Technique)

This is one of the most important lid sharing techniques of reconstruction. Cutler Beard (1955) described this technique for reconstruction of large upperlid full thickness defect by utilizing full thickness advancement flap from the lowerlid⁹. The margin of lowerlid remains intact and acts as a bridge or handle (also known as bucket handle technique).

It is an excellent technique for reconstruction of 60-100% of lid defects. It can be utilized for both the upper and the lowerlids. In the original Cutler Beard procedure lower lid is utilized to repair the upper lid. Utilization of upper lid to repair lower lid coloboma is known as Inverse Cutler Beard procedure. Many oculoplastic surgeons do not advocate inverse Cutler Beard procedure. However, the author has performed inverse Cutler Beard procedure in several patients with excellent results without any iatrogenic complication in the upperlid.

Technique

Bridged advancement flap basically consists of full thickness lid tissue i.e. the skin, muscle, tarsus and conjunctiva. The size of the coloboma of upper lid is assessed. Traction sutures are passed at the edges of coloboma and in the lower lid. Incision line is marked with G.V. paint 4-5 mm below the lid margin corresponding to the size and site of upper lid coloboma(Fig.6). Two vertical incisions are marked towards fornix at the end of horizontal line. Eye ball is protected by placing a lid spatula.

Full thickness incisions are given along the marked lines to create a flap. The coloboma is fashioned into a rectangular defect(Fig.7). Skin, muscle and tarsoconjunctival layers are separated(Fig.8). The flap is pulled towards the coloboma under the bridge. The flap is sutured into the defect in 3 layers. The tarsoconjunctival and muscle layers are sutured with 7-0 vicryl and skin is sutured with 6-0 silk(Fig.9). Antibiotic ointment is applied and a light dressing is done.

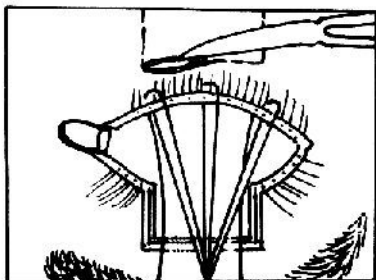


Fig. 6 : Horizontal full thickness incision 5-6mm away & parallel to lid margin. Vertical cuts from the lateral & medial ends of horizontal incision. Convert the coloboma into rectangular shaped defect.

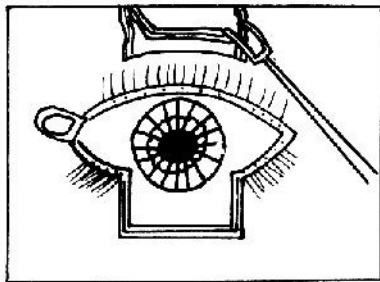


Fig. 7 : Full thickness lower lid advancement flap created.

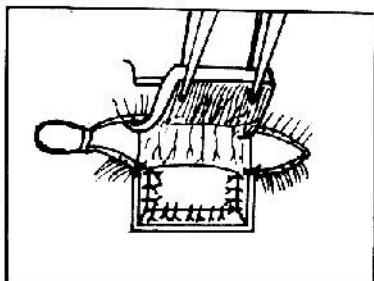


Fig. 8 : Advancement flap passed underneath the bridge. Conjunctiva from the flap has been sutured to the conjunctival remnants of upper lid coloboma. Donor sclera sutured to provide stability. Skin - muscle flap grasped with forceps.

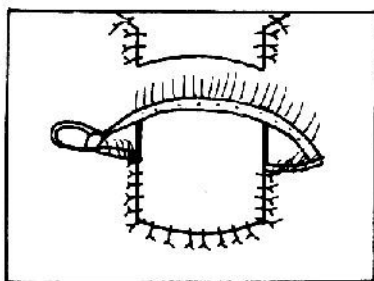


Fig. 9 : Orbicularis muscle & skin laminae sutured.

The second stage

The second stage surgery is done 6 to 8 weeks after the first stage. Earlier division of flap results in shrinkage of new eyelid. The second stage basically comprises of the division of the flap. The bridge is retracted. A horizontal incision is marked with G.V. paint 1-2mm more than the desired level of the lid height. A lens spatula is passed underneath the flap to protect the cornea and provide platform for incising the flap.

The full thickness incision is given with 11 no blade (Fig.10). Brisk bleeding occurs on incising the flap. Haemostasis is achieved by pressing with wet cotton swabs, 1mm strip of skin is now excised from the newly formed lid margin.

Conjunctiva is sutured to skin with a few 8-0 interrupted vicryl sutures. The edges of the base and sides of the host flap are freshened. Similarly, the posterior surface of bridge of the flap is freshened. The tarsoconjunctival, muscular and skin lamellae are now sutured with 6-0

or 7-0 vicryl while skin is sutured with 6-0 silk(Fig.11).

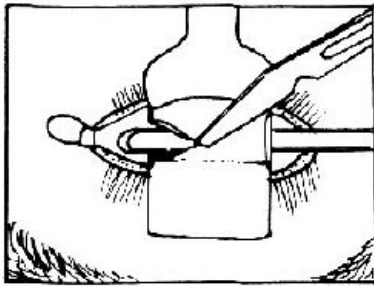


Fig. 10 : Division of the flap after 6-8 weeks.

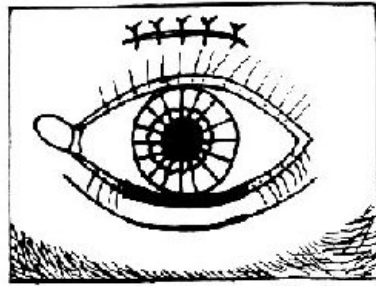


Fig. 11 : Reconstructed upper lid coloboma.

Disadvantages of Cutler - Beard Operation

1. Stimulus deprivation amblyopia in new born and infants
2. Absence of cilia in the newly formed eyelid
3. Edema of the reconstructed segment
4. Notch formation
5. Skin hair rubbing the cornea
6. Shortened upperlid with lagophthalmos
7. Upper eyelid ptosis
8. Lid retraction
9. Minimal/no tarsal plate is transferred to the upperlid in the original Cutler - Beard operation¹⁰. To provide the stability to the upper eyelid Wesley transplanted eyebank sclera¹¹. Ear cartilage also provides excellent stability. Steinogler described the use of Goretex in the lowerlid reconstruction¹².
10. Giant papillae formation in the tarsal conjunctiva.
11. Ischaemic necrosis of the bridge.

Tenzel's semicircular rotation flap

This can be utilized to reconstruct 50% horizontal, central or lateral defects⁸. It can be used to repair both the upper and the lower lids. It is basically a periorbital rotation flap. Semicircular skin muscle incision is given from lateral canthus with concavity towards the coloboma(Fig.12). The incision ends about 2cm posterior to lateral canthus. Lateral canthotomy is performed after raising the flap. Cantholysis of the corresponding crus of the canthal tendon is performed, i.e. the superior crus for repair of upper lid coloboma and inferior crus for repair of lower

lid coloboma(Fig.13).

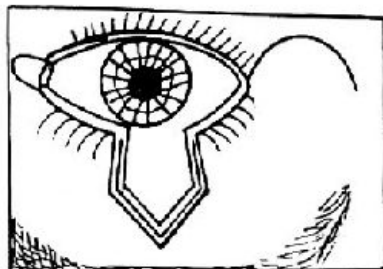


Fig. 12 : Vertical pentagon shaped upper lid coloboma. Mark the semicircular incision with concavity towards the coloboma.

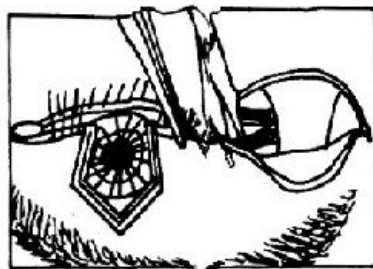


Fig. 13 : Raising of the skin flap and cantholysis of superior crus of lateral canthal ligament.

The semicircular flap is undermined. The lid defect is converted into a vertical pentagon. The conjunctiva of the excised triangle beneath the lid defect is utilized to line the new lid (to make the under surface of the new lid)².(Fig.14) The lid defect is closed by vertical mattress sutures and layered primary closure. The lateral canthus is reconstructed by passing a vertical mattress suture. The skin muscle layer in the temporal area is closed with near-far far-near sutures. At the end of the surgery a very tight lid margin must be present(Fig.15). The lateral portion of the new lid is formed by the flap. Tenzel's flap produces excellent cosmetic results.

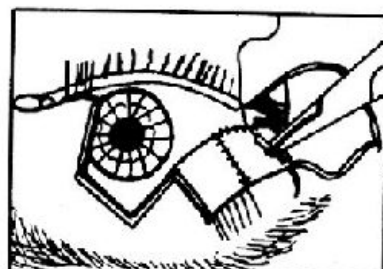


Fig. 14 : Conjunctiva/mucous membrane graft being sutured to line the bare portion of flap.

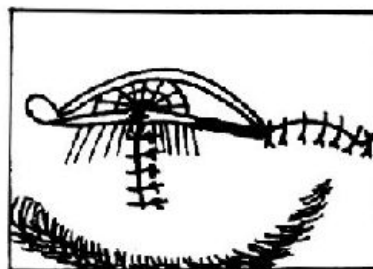


Fig. 15 : Flap has been advanced medially and the pentagon defect closed. The wound at lateral canthus sutured.

Advantages

1. Excellent cosmetic results.
2. Incisions confined to the orbital area.
3. Undermining of the face not required.
4. No cartilage is required to strengthen the newly formed portion

of the lid.

5. The technique is particularly useful for repair of congenital lid coloboma in new borns and infants as it does not cause stimulus deprivation amblyopia.

Disadvantages

1. Unsightly scar
2. No cilia in the lateral part.
3. Notch in lateral part of the lid as there is no rigid support in this part of the eyelid. The procedure has been modified by dissecting a 8mm wide and 10-15mm long facial periosteal flap from the lateral orbital rim region¹³.

Reconstruction of canthal defect

Lateral canthal defects - Involvement of lateral canthus in eyelid malignancies is not very common. The tumours involving lower eyelid may extend to involve lateral canthus. Lid defects involving one third of both the lids may be directly sutured to the periosteum of the lateral canthal region. In larger defects modified Hughes tarsoconjunctival flap with skin flap or graft may be used. A transposition temporal forehead skin flap gives better results as compared to skin grafts in this region. Periosteal flaps may provide additional support for the stability of the lateral part of eyelid and the lateral canthus.

Medial canthal reconstruction

Medial canthus is frequently involved in basal cell carcinoma. It is the commonest malignancy of eyelid. The size of the tissue defect following removal of the tumour depends on the size of the tumour. A tumour larger than 2.5 cm at this site is considered to be a large basal cell carcinoma. Various techniques of reconstruction of medial canthal defects are as follows :-

1. Resection of tumour and spontaneous granulation.
2. Fixation of the medial end of the lid towards posterior lacrimal crest.
3. Tarsoconjunctival flap with skin graft or local flap.
4. Full thickness skin graft.
5. V-Y advancement Frontoglabellar flap.
6. Glabellar rotational flap/ Midline frontal pedicle flap.
7. Horizontal forehead flap (Kruger's flap)¹⁴

8. Temporal forehead flap (Fricke's flap).
9. Rhomboid cheek flap.

Spontaneous Granulation

This is not a popular method. This is very simple method which can be adopted in defects involving deep wounds at nasal bridge and side of nose. The technique may provide acceptable results if medial ends of upper & lower lids are not involved. The raw wound heals by spontaneous granulation in such cases. However, if medial ends of lids are also involved healing by spontaneous granulation would definitely produce cicatricial deformity of involved eyelid & cosmetically unsightly scar.

Fixation of the Medial Ends of Lids

If only medial 25 to 30% of eyelids have been resected along with medial canthus mass, then the medial ends of lids may be directly sutured towards posterior lacrimal crest region with or without lid lengthening procedure. If this is not possible then the lids may be sutured to the skin flap raised to cover medial canthal defect.

Tarsoconjunctival Flap

In this technique sliding tarsoconjunctival (TC) flap from the upper lid is created to provide posterior lamellar lining to the medial canthal region including medial portions of adjoining upper and lower eyelids. Medially the flap is sutured to the posterior reflection of medial canthal ligament. Inferiorly and laterally it is sutured to posterior lamina of lowerlid. Local skin flap or full thickness skin graft is used to cover the flap. TC flap is also used for reconstruction of lateral canthus and adjoining missing eyelids.

Full Thickness Skin Grafts

Skin grafts are frequently used to cover medial canthal and periorbital tissue defects. However, in view of thick periorbital skin, extensive, uneven and bone deep defects, full thickness skin graft are usually associated with several disadvantages such as poor take-up, unsightly depressed scars, poor colour matching and lid instability.

Skin Flaps

Skin flaps from the local periorbital region play a vital role in covering periorbital tissue defects involving medial/lateral canthus. The skin flaps can be classified into advancement flap, rotation and transposition flap. Skin flaps provide best cosmetic and functional advantages over skin

grafts due to their local origin. Skin flaps provide excellent matching as they maintain their original colour and texture. Skin flaps undergo minimal contraction, provide their own blood supply, maintain surface contours and prevent sunken appearance. Periorbital skin flaps commonly used in lid reconstruction include V-Y advancement frontoglabellar flap, glabellar rotational flap, midline frontal pedicle flap, horizontal supraorbital flaps (Fricke's, Kruger's flap, Rhomboid flap) etc. In author's series of reconstructive surgeries^{14,15} basal cell carcinoma (BCC) was the commonest malignancy. Medial canthus was the commonest site of involvement. The resection of the tumour resulted in very large (6.9cm X 3.2cm to 8.3cm X 6.2cm) irregular and often bone deep defects. Reconstruction was performed utilizing the horizontal forehead pedicle/ transposition flap, with or without myocutaneous advancement flap, conjunctival autograft, transposition flap from the neck and Fricke's flap with excellent cosmetic and functional results without any recurrences^{14,15}.

Conclusion

The literature is replete with a variety of techniques of lid reconstruction. Each has its merits and demerits. No single technique can be used to repair all the defects. Each defect should be examined & evaluated carefully before deciding on a particular technique. Surgeon should not learn one or two techniques and try to fit them to all the tissue defects. Complex eyelid reconstruction requires thorough knowledge of several techniques and their range of applicability. Several techniques may have to be combined in complex lid reconstructions. Although no hard and fast rules can be laid down for specific cases, the procedure which produces functional improvement and best cosmetic result and is most convenient for the surgeon should be the procedure of choice.

References

1. Dutton Jonathan J : Atlas of Ophthalmic surgery volume 11: Oculoplastic lacrimal and orbital surgery, *Mosby Year Book* 1992.
2. McCord CD : Eyelid surgery. Principles and techniques Lippincott - *Raven Publishers* 1995; 252-311.
3. Stallard HB : Eye Surgery, *KM Varghese Co. Bombay, India* 1973.
4. Callahan A : Free composite lid graft, *Arch Ophthalmol* 1954; 45 : 539.
5. Borges AF : Elective incisions and scar revision, *Boston : Little Brown : Boston*.1973.

6. Kdraissi CJ : The selection of appropriate lines for elective surgical incisions, *Plast Reconstr Surg* 1951; 1:8:1.
7. McGregor IA : Fundamental techniques of plastic surgery. New York : Churchill Livingstone; 1989.
8. Tenzel RR : Reconstruction of the central one half of an eyelid. *Arch Ophthalmol* 1975; 93: 125-125.
9. Cutler N, Beard C : A method for partial and total upperlid reconstruction, *Am J Ophthalmol* 1955; 39:1-7.
10. Wesley RE, McCord CD : Height of lower tarsus of the lower eyelid, *Am J Ophthalmol* 1980;90: 102-105.
11. Wesley RE, McCord CD : Transplantation of eyebank sclera in the Cutler-Beard method of upper eyelid reconstruction, *Ophthalmology* 1980;87:1022-1028.
12. Steinkogler FJ :A sandwich technique for reconstruction of the lower lid. *Orbit* 1989;8:37-43.
13. Tenzel RR and Stewart WB : Eyelid reconstruction by the semicircular flap technique, *Ophthalmology* 1978; 85:1164.
14. Gupta VP et al : Reconstructive surgery for large periorbital basal cell carcinomas. *Ind Ophthalmol Today* 1994; 52:350-352.
15. Gupta VP et al : Reconstructive surgery for eyelid tumours, Paper presented at 57th ALOS Conference, Cochin, Jan 7-10, 1999.

AIOS CME SERIES

No. 1	Paediatric Cataract	<i>Dr. Daljit Singh</i>
No. 2	Eales' Disease	<i>Dr. B. Patnaik</i>
No. 3	Management of Diabetic Retinopathy	<i>Dr. P.N. Nagpal</i>
No. 4	Management of Endophthalmitis	<i>Dr. Lalit Verma</i>
No. 5	Oculoplastic Surgery - Practical Guidelines	<i>Dr. A.K. Grover</i>

Published by :

ALL INDIA OPHTHALMOLOGICAL SOCIETY

Dr. Rajendra Prasad Centre for Ophthalmic Sciences,
All India Institute of Medical Sciences,
Ansari Nagar, New Delhi - 110 029

