A DISSERTATION ON

EARLY RELEASE AND SKIN GRAFTING OF UPPER EYELID BURNS FOR PREVENTION OF ECTROPION

M.Ch., DEGREE
BRANCH - III - PLASTIC SURGERY

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CERTIFICATE

This is to certify that this dissertation entitled **"Study on Early Release & Skin Grafting of upper eyelid burns for prevention of Ectropion"** is a bonafide work done by **Dr. K. Boopathi,** under our guidance and Supervision in the Department of Burns, Plastic & Reconstructive Surgery, Government Kilpauk Medical College & Hospital, Chennai-10 submitted for the **M.Ch.,** in **PLASTIC SURGERY**, **Branch - III,** examination, to be held in August 2009, by the **Tamilnadu Dr.M.G.R. Medical University, Chennai.**

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DECLARATION

I Solemnly declare that the dissertation titled **"Study on Early Release & Skin Grafting of upper eyelid burns for prevention of Ectropion"** was done by me at **Govt.Kilpauk Medical College & Hospital, Chennai-10** during September 2006 to March 2009 under the guidance and supervision of **Prof.S.R.Vijayalakshmi., M.S.,M.Ch., (Plastic Surgery**) Professor and Head of the Department of Burns, Plastic and Reconstructive Surgery.

The dissertation is submitted to the **Tamilnadu Dr.M.G.R. Medical University** towards partial fulfillment of requirement for the award of M.Ch., Degree (Branch-III) in Plastic Surgery.

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CONTENTS

INTRODUCTION

Burns trauma is as old as the discovery of fire in the history of mankind. Eye lid burns are more common among the eye traumas. They induce different effects on the ocular structures, depending on the type of burns. The eyelid plays a vital role in protecting vision, which is the most important sensation. No doubt the eyelid is compared to a mother protecting a child amidst all circumstances- day in and day out. Eyelids are delicate, complicated in their anatomy and physiology. Eye lids are more prone to be damaged in the effort to save the eyeball.

No day passes without winking of the eye. The eyelids do their function involuntarily without our knowledge, yet they can co-operate with us in-voluntary closure also. In ocular burns in an effort to save the eyeball the lids take the toll. Ocular burns injury can be in the form of acid burns, thermal burns or hot liquid.

This is a study of injury of the eyelid due to burns and the effect of early intervention to restore the normal anatomy in retaining the function of eye.

The majority of thermal injuries are common in developing countries, where many people still use open fire for cooking. Due to the paucity of acute medical resources, adequate acute burn care,

many thermal burns heal by secondary intention, and therefore many survivors develop massive post burn contracture. As the upper eyelid burns wound heals with granulation tissue- scar hypertrophy with or without ectropion are more common. Severe thermal injury commonly result in considerable functional and aesthetic deformities.

Most of the accidental burns are domestic due to open fire. Even now most of the low income group families use kerosene pressure stoves, kerosene wick stoves for cooking and kerosene lamps for illumination. They are involved in cooking accidents due to spillage of kerosene from the stoves or pressure stove burst.

Burns care management involves management of shock, prevention and control of infection, early excision, wound coverage, physiotherapy and rehabilitation.

Eyelid burns may occur as an isolated entity or associated with generalized burns. Eyelid contracture in the form of ectropion is one of the common deformity among post burn deformities.

Severe burn injury of the eyelid assume considerable importance because of disfigurement, deformity and loss of vision- incapacitating the victim altogether. There are certain difficulties in the management of eyelid burns both during early phase and later during the reconstructive phase. The depth of the injury, delay in the

treatment, infection and inefficiency of acute burn care are the important causes that result in contracture of the eyelid and further ocular complications.

Good management of eyelid burns injury is necessary to prevent ectropion and ocular complications. Ectropion is a clinical condition wherein eyelids turn outwards from the globe, so complete closure of the eyelid over the globe is difficult or impossible. The palpebral fissure remains open even on the attempted closure of the eye lids.

Ectropion results from burns injury of the eyelid are called cicatricial ectropion.

Cicatricial ectropion is due to cicatrix of the anterior lamella of eyelids. In other words due to deficiency of skin and muscles of the eyelids. According to the extent cicatricial ectropion can be a

Mild

Moderate

Severe

Cicatricial Ectropion.

Since the ciatricial ectropion is common and carry a large amount of morbidity and vision loss, it was thought that a detailed study will be worthwhile , which will help us to understand the etiological factors, aggravating factors and how manage them effectively with less chances of recurrences.

Cicatricial ectropion results from burn injury can be designated as

1. Intrinsic ectropion - Due to actual loss of eyelid tissue
2. Extrinsic ectropion - due to loss of facial skin around the eye
3. Malignant ectropion - Due to severe post burn squeale characterized by eversion of both eyelids with medial canthus being pulled towards the bridge of the nose.

Modern burn care is based on operative wound management. Prompt excision and skin grafting is life saving for patients even with the larger burns. Deep partial and full thickness burns of the eye lid needs to be excised and grafted as early as possible in order to prevent cicatricial ectropion and further ocular complications. Surgical treatment is most effective at the primary stage of destruction and can dramatically change the prognosis.

Reconstruction of the severe cicatricial ectropion is more challenging problem for the reconstructive surgeon. Various surgical techniques in eyelid burns reconstruction, such as split thickness skin graft, full thickness skin graft and pedicle flap cover are available. This study is to follow up the results of early release of eyelid burn and reconstruction with split thickness skin graft.

AIM OF THE STUDY

1. To evaluate the efficacy of the collagen application immediately on admission, & early release and skin grafting for the prevention of ectropion in upper eyelid burns.

2. Release incision and apply collagen on admission in III degree flame burns and acid burns and early STSG within 6 days for upper eyelid.

OBJECTIVE

1. To find out the simple procedure to prevent (or) minimize problem in acute phase of upper eyelid burn.

2. To find out the optimum reconstructive procedure.

3. To find out post operative complication and factor to prevent.

HISTORY

Ambrose pare in (1510-1590) treated burns with variety of ointments and onion. He also described the procedure for early excision of burn wound.

GF Hildams, The German surgeon described the patho physiology of burns and treatment for contracture.

Dupuytren in the early 19 th century treated burns injury, using occlusive dressing. Developed classification for burn depth which is used till now

Reverdin in (1869) introduced the concept of the skin graft for eyelid reconstruction.

Lawson in (1871) was the first successful surgeon to do skin graft in a case of ectropion in 1870

Le fort in (1872) of France and Wolfe (1876) of England transplanted full thickness skin graft.

Teale in1860 did the correction of a symblepharon by using a conjunctival flap.

In 1884 Bock used mucous membrane as a graft for conjunctival defect reconstruction.

Stellwag in (1889) reconstructed the same defect with vaginal mucosa.

The poor cosmetic results with skin from the arm and leg led Gardening in 1904 to graft eyelid skin from the opposite eye for eyelid defect; He was the first to introduce one of the principles of eyelid reconstruction.

Von Grafe in 1818 constructed a lower lid with a cheek flap.

Fricke in (1829) did both upper & lower lid reconstruction with zygomatic and temporal flap.

Davis in 1919 mentioned about the Thiersch graft for immediate coverage of the orbital cavity

Wheeler in 1912 pointed out the feasibility of applying an immediate skin graft directly over the bone, muscle tendon, facia or periosteum without waiting for the granulation tissue.

REVIEW OF LITERATURE

Effect of eyelid burn on eyelids & tear film

A review of the normal lid function is essential to understand the effect of ectropion. According to Moses (1975) the eyelids have important functions which are sub served not only by the mere presence of the lids but also by their constant movements. These movements are elevation, effected by the levator palpebrae superioris and closure effected by the orbicularis oculi. Both these movements are incorporated in the act of blinking.

During waking hours, the levator is in a state of constant contraction and the orbicularis is in relaxed state. During sleep the orbicularis contracts and levator relaxes. Thus they are antagonistic to each other. This has been proved by EMG studied by Gordon (1951). He has also divided the orbicularis into three functional groups based on EMG studies, those of the first group which respond in blinking is the pretarsal part of the orbicularis, those of the second group which respond in blinking and sustained closure, is the orbital part of the orbicularis. Thus various types of closure are possible and they serve the following purpose by the action of reflex and spontaneous blinking. Reflex blinking is mainly protective in nature but spontaneous blinking is said to provide momentary rest for the ocular

muscle, maintain a stable tear film and protect the cornea and take part in the lacrimal pump mechanism in drainage of tears.

The lacrimal pump has been well proved by Jones (1958) who showed that the fascia reflected from the periorbita converts the lacrimal fossa into a completely closed cavity. The fascia thus forms a diaphragm which creates alternate positive and negative pressure by its movement. These are brought about by the contraction of the superficial and deep head of the pretarsal portion of the orbicularis and the deep head of the preseptal portion of the orbicularis. Blinking creates a constant pump like action which draws the tears into the lacrimal sac and into the nose

The role of the lid in maintaining a stable tear film has been extensively studied. Wolff (1954) was the first to describe the three layers of the tear film. Norn (1969) proposed that the pre-corneal tear film as described by Wolff is formed also with opening the eye and is kept distributed between the palpebral borders which act as a frame for the film.

Further work by Lemp et al., (1970) proved that conjunctival mucus spread by the action of the lids and adsorbed on the corneal surface is the principle factor in spreading the pre-corneal tear film by its ability to lower the surface tension. According to the present model of tear film function by Holly et al.,(1977) when the eyes

remain open, the superficial lipid layer seeps into the aqueous layer and contaminates the deep mucus layer which is normally responsible for adsorbing the aqueous tears to the hydrophobic corneal epithelium. This contamination raises the surface tension of the tear film and when it exceed that of the corneal epithelium the tear film snaps open to form a dry spot and a punctate epithelial keratopathy. When the upper lid descends in the act of blinking it removes the lipid contaminated tear film including the mucus layer. When the lid closes the conjunctival globet cells deposit a layer of mucus on the epithelium which lowers the surface tension. When the lid rises, its margin drag the aqueous tears from the intermarginal strip and the Meibomian gland lays down lipid over it. Therefore the tear film remains stable.

Based on the above theory Warring (1979) proposed that an adequate force and speed (8 cm/sec) of the upper lid is necessary for removing the lipid contaminated mucin layer and pulling up the aqueous layer. When this is deficient as in cicatricial ectropion the tear film forms and loses its stability. Earlier studies by Doane (1980) have revealed some interesting facts about blinking. According to him most spontaneous blinks are incomplete but a few complete blinks occur in between, in order to prevent the exposure keratitis.

His study has revealed that the following events that take place during spontaneous blinking:

a. Descent of the upper lid at the rate of 17-20cm/sec.

b. Horizontal motion of the lower lid in a nasal direction for 2-5 mm, synchronous with the upper lid descent.

c. Posterior movements of the globe by 1-6 mm due to the orbicularis tone.

In ectropion all the above get deranged and this leads to following problems:

Epiphora : Normally the tears collect and tend to form a tear lake at the inner canthus. The further passage of tears into the lacrimal sac is assisted by the action of the orbicularis oculi each time the patient blinks. Mc Laughin (1950) gave the following reasons for epiphora in cicatricial ectropion .

1. The tear lake lies in the middle of the lower fornix away from the punctum due to ectropion

2. The punctum is not in contact with the globe due to eyelid edema and its lumen is narrowed.

3. There is no effective contraction of the orbicularis and therefore the lacrimal pump is deficient and so tears fail to enter lacrimal sac.

4. The caruncle is hypertrophic.

5. Undue exposure of the eye itself may increases the reflex lacrimal secretion.

He states the that the work of Krogh et al., in 1945 has proved that there is an increased evaporation of tears as the drainage is obstructed and this results in increase in the sodium chloride content of tear, which irritates the eye there by initiating reflex secretion.

Exposure keratitis and xerosis : Lemp (1971) has stated that periodic resurfacing of the tear film is necessary to maintain a continuous film.

According to him interference with the normal blink mechanism results in extensive areas without an overlying tear film which in turn gives rise to severe corneal desiccation and desquamation. Reflex blinking is affected in cicatricial ectropion. But some surfacing is possible in those patients with an intact Bell's phenomenon. This mechanism, however, is insufficient to maintain an adequate tear film over the inferior cornea which is seen diffusely staining of the inferior 1/3 of the cornea. In severe cases, especially

when Bell's phenomenon is absent there occurs marked corneal desiccation and secondary keratinisation. He has proposed that mucin deprivation on a distribution basis is a major factor in promoting keratinisation.

Mild exposure keratitis can be detected with fluorescein, Rose Bengal staining and slit lamp examination.Where as severe exposure keratitis give rise to corneal ulceration and sometimes perforation and partial anterior staphyloma formation.

Cosmetic disfigurement : Somerset et al., (1960) have stated that in upper lid burns the upper lid is retracted upwards by the scar results in staring look. Also, the ectropion and the half closed palpebral fissure results in cosmetic disfigurement.

Fig.2a

Anatomy of Upper Eye Lid

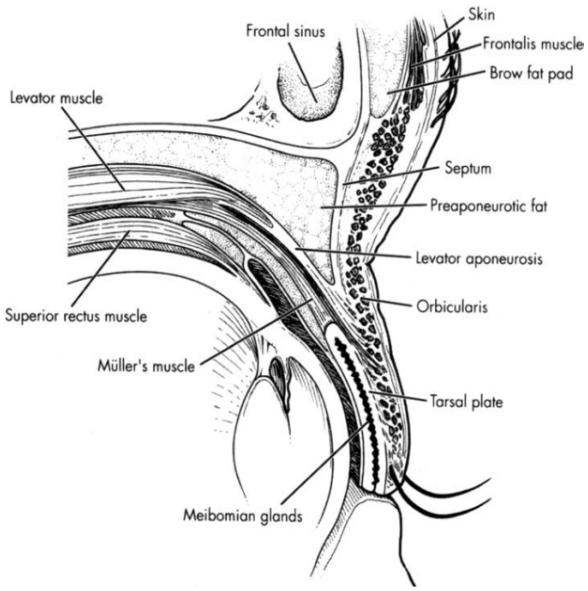


Fig.2b

Anatomy of Eye Lid Margin

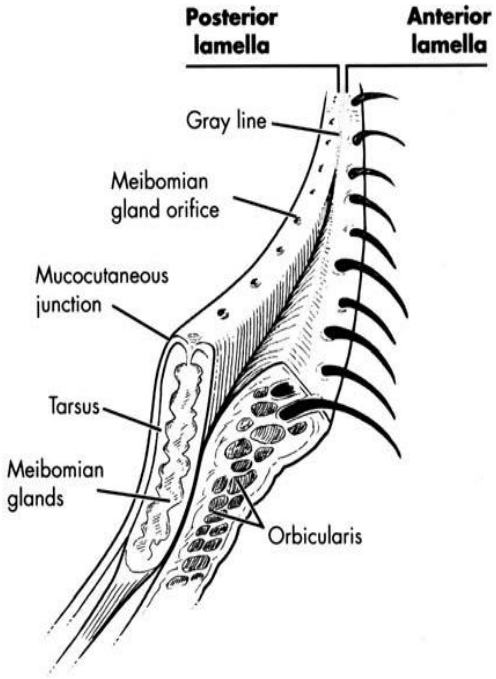


Fig.2c

Anatomy of Upper Eye Lid Skin

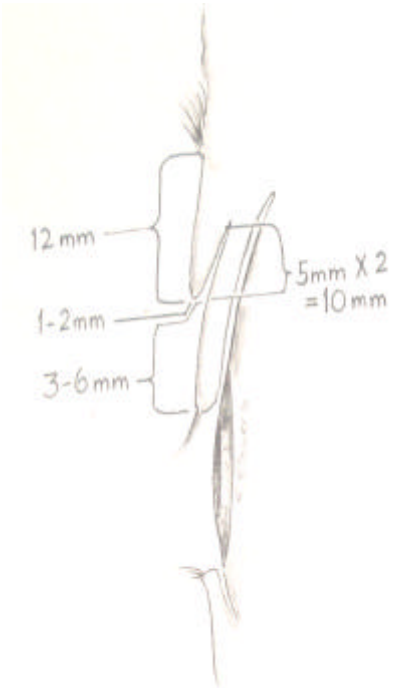
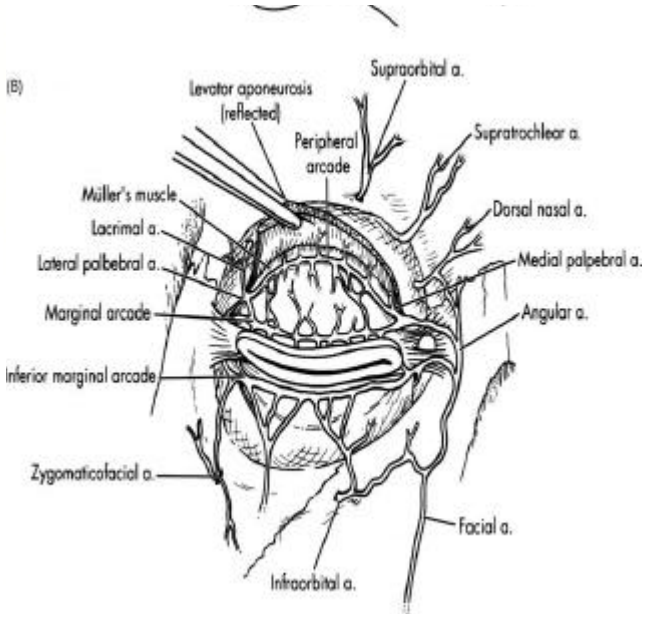


Fig.2d

Blood supply of Upper eye lid



SURGICAL ANATOMY OF THE EYELID [6,7,8]

The upper eyelid is made up; of anterior, middle and posterior lamella. Anterior lamella is composed of skin, subcutaneous tissue and orbicularis oculi muscle, Middle lamella is composed of tarsus, levator muscle, orbital septum and orbital fat. Posterior lamella is composed of the Muller's muscle and conjunctiva. The tarsal plate measures 10 mm in vertical length. The lid Margin measures 30 mm in horizontal length. Three to four rows of the cilia are present and directed up and away from the ocular surface. (Fig. 2a)

From anterior to posterior, the eyelid margin composed of the lash line, Meibomian gland orifice, the grey line and mucocutaneous junction. The lash line is defined by rows of eyelashes. The Meibomian gland orifices are seen as a row of tiny pores within the tarsal plate (Fig.2b). The grey line defines the juxtaposition of the anterior and posterior lamella and represents the superior end of Riolan. The muco cutaneous junction separates the keratinized from the non keratinized epithelial border of the lid margin. This landmark is extremely helpful in obtaining a correct anatomic alignment of the eyelid. The lower eyelid extends from the lid margin to the cheek area. The anterior lamella is composed of skin and orbicularis muscle. The middle layer is composed of tarsus orbital fat, superior extension

of the capsulo palpaberal fascia and orbital septum, Posterior lamella is conjunctiva.

Blood Supply (Fig.2d)

The blood supply comes from the medial palpebral branch of the ophthalmic artery and palpebral branch of the lacrimal artery. Blood supply of eyelids is by the major vascular arcade (Fig. 1b). The marginal vascular arcade lies just above and parallel to the lid margin beneath the orbicularis. The peripheral arcade lies above the superior tarsal border between the levator and Muller's muscle. The lower lid is supplied by inferior marginal arcade and it lies between the tarsal plate and the orbicularis.

Lymphatic Drainage

The lateral portion of the eyelid and the lateral canthus area drain to the superficial and deep parotid nodes. The medial portion of the lids and the medial canthal area drain to the submandibular lymph nodes**.**

Closure of the palpebral fissure is produced mainly by the downward displacement of the upper eyelid. The natural curvature of the upper lid is maintained by the static shape of stiff tarsal plate combined with adaptation of the lid to the rounded globe at the point

where it rest. If the eyelid is held by scar the complete closure is not possible - corneal injury, dryness and aesthetic disfigurement may occur.

Definition for beautiful eye as follows. There is high degree of symmetry, concavity of the upper lid. (Roberts Flower)

Lid fold; The vertical height of the pre tarsal lid segment in its central portion should be not more than one third to one fourth of the vertical distance between lid margin and the border of the resting eyebrow. A crisp and precise lid fold is a desirable feature. A fold that displays generous distance between its visualized invagination and the lid margin showers youthfulness of the eyelid.

Lid Aperture - Most aesthetically pleasing eye is a generous lid aperture but with limited scleral show. The most pleasing aperture is the one with an almond shape, with upper lid covering 2- 3 mm of the upper margin of the cornea

Inter canthal Tilt - An upward tilt from medial to lateral of the inter canthal axis.

Eye Lashes - Of the upper eyelid should be erect more or less than to be perpendicular to the erect axis of the body.

Eyelid skin - Skin of the eyelid is thinnest, most delicate and elastic in the body. Less then 1 mm in thickness and contain 8-10 cell layers. The subcutaneous layer is free from fat. The epidermis consists of 4 layers, basal cell layer (stratum germinativum), squamous cell layer (stratum spinosum), granular layer and layer of keratin (stratum lucidum and corneum). Eyelid skin is moderately adheres to the orbicularis oculi muscle over the tarsus.

And it is more mobile and loose as the orbital rim is approximated. The eyelid skin becomes thickened at the junction with the skin of the cheek and other areas surroundings the orbit. The areas of transition correspond roughly to the bony orbital margin. The bi layer composition of the skin provides an external water repellant and internal vapor barrier and is the anchor tissue for all dermal appendages. Eyelid skin confirms to the eyelid contours associated with muscle action and is sufficiently elastic to allow for drastic changes in contours.

26mm to 30mm of skin is necessary for the upper lid between brow and lid margin for normal contour, normal invagination and normal closure. This allows minimum of 1 cm for the invagination process and a minimum of 12 mm from fold to brow and 3 to 6mm of visualized pre tarsal skin. Fig 2c. 1 to 2mm is necessary for bend.

Less skin than this prevents lid fold invagination or restricts proper brow positions.

Function of eyelids:-

1. Protect the eye from wind-born dirt and debris and drying effects of the environment.

2. The eyelids retract, or open, to provide an uninterrupted visual axis for seeing.

3. The eyelid contains accessory lacrimal glands of Krause, Wolfring and Meibomian glands and they secrete aqueous and lipid portion of the tears.

4. The eyelids blink to spread the tear film evenly over the eye which is essential for visual clarity.

5. The lids act as a lacrimal pump to remove the tears from the ocular surface and drain them in to the nose.

6. Burn injuries to the eyelids can compromise one or all of these functions and cause visual debilitation.

ETIOLOGY OF BURNS

According to the place of occurrence, burn injuries are classified as

Domestic,

Industrial

Miscellaneous

Causes of burn injury- are numerous and for convenience of study it is classified as

Thermal burns - Flame burns and contact burns

Scald.

Chemical – acid and alkali burns.

Electrical burns.

Eye lid burns reflects the different stages of progression, with a first stage of destruction, a second stage of cleaning and inflammation, and a last stage of reconstruction and scarring.

Severity of eyelid burns injury correlates directly to exposure duration and the causative agent. In particular chemical burns severity directly relate to the solution ph, solution quantity and solution penetrability. Burns injury damages tissues primarily by denaturing and coagulating cellular proteins and secondarily through vascular

ischemic damage. Whether thermal or chemical, the severity of burns injury results from the depth and degree of epithelial damage and limbal ischemia. If the limbus is involved significantly, the cornea may develop recurrent epithelial defects, and conjunctival invasion on to the cornea may occur. This is due to the loss of stem cells responsible for renewing corneal epithelium.

MECHANISM OF INJURY

Thermal burns;

Heat denatures the cellular proteins resulting in cell coagulative necrosis. The severity of the injury is related to the intensity of temperature and length of exposure. Hot liquids usually produce partial thickness burn injury. Full thickness burns injury may occur due to prolonged contact with the causative agent.

Chemical burns;

The extent and severity of the chemical injury is dependent upon the agent strength or concentration, quality of physical state, duration of contact and penetrating power. The chemical agent which causes burn injuries are classified in to

1. **Desiccants** - Sulfuric acid is the most common cause for chemical ocular injury. Sulfuric acid is a powerful desiccant and has great potential for permanent ocular damage; it reacts with the water present in the pre ocular tear film, and producing heat sufficient to cauterize the corneal and conjunctiva epithelium. Sulfuric acid causes damage by dehydration of tissue and at the same time involved in exothermic reaction to release heat in to the tissue.

2. **Corrosive such as phenol,**

3. **Salt forming agents** : such as formic, tannic, and Hydrochloric acid;- The hydrochloric acid is a strong acid and while in contact with the skin the burn progresses because the acid continuous to denature the protein. A coagulum forms over the affected areas under which ulcer present.

4. **Oxidising agent :** sodium hyopochloride 5. Vessicant; D.M 80and nitrogen mustard.

Electrical injury :

The severity of the electrical eyelid burns injury depends on the type of current- (direct or indirect,) voltage and amperage, resistance of the body parts through which current passes and duration of the contact. The high voltage current tend to take direct path from the

FIG.1 TYPES OF BURNS

(a)

Epidermal Burn

(b)

Superficial Partial Thickness Burn

(c)

Deep Partial Thickness Burn

(d)

Full Thickness Burn

point of contact to ground, whereas low voltage alternating current more frequently results in cardiac arrest and death. The body part through which the electricity passed may appear viable. Flame injuries may also result from electrical sparks which ignites clothing. Electrical flash burn injury will produce eyelid burn.

DEPTH OF BURNS

Epidermal burns; Fig.1a

They are dry burns with edema and without blisters. Erythema and pain are common. Only involves epidermal layers. Healing occurs within 3 to 7 days.

Suprficial partial thickness burns; Fig.1b

They present with blisters, weep and moist blebs. Intense erythema, pain and temperature sensitivity are present. Epidermis and papillary dermis are involved. Healing occurs within 10 to 14 days.

Deep partial thickness burns: Fig.1c

They are commonly produced by longer duration of flame burns injury. Blisters are large and thick walled, the skin appears mottled white and pink to cherry red. Epidermis and papillary dermis, and reticular dermis are involved. Subcutaneous involvement may occur. Healing occurs within 14 to 28 days in an uncomplicated case.

If infection occurs, the wound may convert in to a full thickness injury. Late hypertrophic scar tendency is more on healing.

Full thickness burns; Fig 1d

Full thickness burns is at high risk for infection due to the presence of dead tissues and lack of blood flow. The skin appears dry, leathery, non pliable, charring, and eschar. Little or no pain; the hair in the affected area pulls out easily. The wound includes the subcutaneous tissue and fascia muscle, tendon and bone. Surgical excision and grafting will be needed. Full thickness or third degree burn occurs with destruction of the entire epidermis and dermis, leaving no residual epidermal cells to resurface**.**

Corneal burns are classified into 4 grades,

As follows: The prognosis depends on the depth of the injury.

- Grade 1: Only corneal epithelial loss is present. No conjunctival ischemia is found. The prognosis is very good.
- Grade 2: Corneal edema and haziness are present. The conjunctival ischemia affects less than one third of the limbus. Some permanent scarring may occur.

- Grade 3: Cornea has significant haziness. Limbal ischemia is less than one half of the limbus. Prognosis is variable, and vision is usually impaired.
- Grade 4: Cornea is opaque, and the limbal ischemia is greater than one half of the limbus. Globe perforation may occur.

Pathophysiology of burns;

It is obligatory that a brief reference is made to actual burn wound healing, so that the preventive and corrective measures are better understood.

Three concentric zones of burn injury are (1) the central zone of coagulation represents the direct heat damage consisting of protein coagulation with cessation of blood flow through arterial and venous channel which results in irreversible cell death. If the zone extend below the dermal appendages a full thickness burn injury results, whereas if it lies above the dermal appendages a partial thickness skin injury occurs with the potential for spontaneous healing .

The zone of coagulation is surrounded by the (2) zone of stasis characterized by oxygen and nutrients starved tissue. If the area of stasis is protected from infection and desiccation the area may ultimately survive and heal. (3) Zone of hyperemia surrounds the

zone of stasis and is the site of minimal cell involvement. Early spontaneous recovery is possible with appropriate care

Severe burn injury produces venous stasis micro thrombi formation and vascular endothelial sloughing.

A superficial burn, if uninfected, will heal within 7-10 days often without major scarring. A deep partial thickness burn, if uninfected will heal within 10- 21days. A full thickness burn, even if uninfected, will only heal over a prolonged period of time, by contracture and scar tissue.

Rapid healing of the burn wound results in reduced hospital stay, less scarring, less skin contractures and reduced morbidity and mortality.

Burn Wound Healing,

Healing is a systematic process, traditionally explained in terms of three classic phases namely inflammation, proliferation, and maturation.

Inflammatory response;

The capillaries and venules in the burn wound become highly permeable to fluids, electrolytes and proteins. Platelets adhere to vessel walls and Polymorphonuclear leucocytes aggregation occurs.

The increasing venous resistance causes edema. In severe thermal injuries micro thrombi are formed and occlude the micro circulation causing further cell death. Chemical mediators released from the site of injury are responsible for the development of the typical inflammatory response. The inflammatory response to thermal injury results in rapid and dramatic edema formation. Artuson and colleagues describe about the phenomena of edema formation. It is the combined effects of three mechanisms.

1. Dilatation of resistant vessels resulting in increased transcapillary filtration pressure.

2. Increased extravascular osmotic activity in damaged tissue.

3. Increased microvascular permeability to macromolecules.

The combined effects of the alterations result in rapid loss of vascular fluid into the interstitium. Heat denatured proteins stimulate the acute inflammatory process by activating complement cascade. The activated complement system facilitates the liberation of various permeability factors at the site. Histamine is one of the first mediators released and elevated level of histamine has been measured in the serous drainage following thermal injury. Other permeability factor released as prostoglandin. Recently the endoperoxidase, thrombaxane which causes platelet aggregation and contract vascular and airway

smooth muscles have been found and quantitated in burn blister fluid. Water and heat loss from the burns wound is continuous. The burn wound has hyper osmotic zone which absorbs more water from the surrounding tissues.

Following the injury, the products of the earliest cellular events activate inflammatory pathways that modify subsequent events in the would-healing process. For example Hageman factor activates the kinin pathway, which produces bradykinin. Bradykinin stimulates vasodilatation and increased vascular permeability. Histamine released from platelets and circulating mast cells increases vascular permeability and indirectly stimulates the vasodilatation. Through the production of prostaglandins E_1 and $E_{2,}$ vasodilatation is produced. At the area of the injury through the activation of phospholipases of arachidonic acid, prostaglandins, leukotriences and other factors are produced .

Proliferative Phase

Formation of granulation tissue is a central event during the proliferative phase. Inflammatory cells, fibroblasts, and neovasculature in a matrix of fibronectin, collagen, glycosaminoglycans, and proteoglycans comprises the granulation tissue.

The fibroblast is a critical component of granulation tissue. Fibroblasts are responsible for the production of collagen, elastin and fibronectin. The synthesis and deposition of collagen is a critical event in the proliferative phase.

Angiogenesis

A rich blood supply is vital to sustain newly formed tissue and is appreciated by the erythema of a newly formed scar. Angiogenesis occurs concurrently with fibroblast proliferation. During this phase the endothelial cells migrate towards the area of the wound proliferates and form the new capillaries. When the tissues are adequately perfused, migration and proliferation of endothelial cells is reduced.

Remodeling phase.

Wound contraction begins almost concurrently with collagen synthesis. Contraction, defined as the centripetal movement of wound edges facilitates closure of a wound defect.

Abnormal Wound Healing;-Hypertrophic Scars

Hypertrophic scars are characterized by an accumulation of excess collagen and are distinguished from each other by their appearance. Hypertrophic scar contains increased amount of type III collagen then type I collagen. The collagen fibers in hypertrophic scars are loosely arranged in a wavy pattern. This demonstrates a disorganized pattern of large, irregularly shaped collagen fibers with a lower content of collagen cross-links compared to normal skin.

Abnormalities in cell migration, proliferation, inflammation, synthesis and secretion of extra cellular matrix proteins, cytokines, and remodeling have been associated with hypertrophic scar formation. Increased activity of fibrogenic cytokines and exaggerated response to cytokines has been noted in hypertrophic scar.

Alteration in host responses and sensitivity to infection;

Several factors are responsible for the decrease resistance to infection in the burn wound. These include the following.

1. Epidermal loss exposes vital tissues to bacterial colonization and invasion.

2. The burn eschar and exudates are the ideal media for growth of bacteria.

3. Coagulative necrosis and loss of circulation prevent humoral defences entering the affected tissues.

4. Alteration in humoral antibody activity.

Pathology of the burn wound contracture;

Superficial and epidermal burns heal without scarring. This is due to new dermis formation from the remnant of the adenexal structures. Burns extending only up to papillary dermis are heals without scarring. In full thickness burns there is no underlying adenexal structure for neo epidermis formation, and hence the deeper burns heal with hypertrophic scar. Skin graft application provides the only source of epidermis in deep burns and prevents the hypertrophic scar.

Myofibroblast (29) present in the dermis have contractile element through which the cell is attached to the adjacent collagen fibers. It has been postulated that these myofibroblasts are responsible for the burn scar contracture and collagen disorientation - characteristic of the hypertrophic scar. Myofibroblast present in the dermis causes microvascular occlusion resulting in hypoxia. The hypoxia in the tissues stimulates excessive collagen production which results in hypertrophic scar. Early skin grafting after burn wound excision always gives a superior scar compared to wound healing by

secondary intention, where no skin graft is applied. Deeper burns wounds, if not skin grafted healed by secondary intention. Mast cells have been found to be greatly reduced in the presence of skin graft.

Management options;

Eschar separation and burn wound healing;

The dead tissue which resulted from the burn injury is called an eschar or slough. Healing of the underlying living tissue can be hindered by the presence of the eschar and the eschar may be a source of sepsis, which infects the burn wound. In this way, a superficial burn may become a partial thickness and a partial thickness burns may become full thickness burns.

As the acute inflammatory response reaches its peak two or three days following thermal injury, the small but still functioning vessels regain their integrity and reabsorb the extravasated fluid. Macrophages appear in the area. The invading colonized bacteria secretes collagenase and other protease, starting the separation (lyse) of dead from live tissues. Angiogenic factor, secreted by hypoxic macrophages marginated at the wound edges. This angiogenetic factor is responsible for neovascularisation and granulation tissue formation.

Deeper macrophages secrete growth factors which stimulate fibroblast proliferation, deposition of collagen and fibronectin. If the wound is not healed within 14 days, myofibroblast – fibroblast bundles form excess collagen while mast cells release mucopolysaccharides and histamine, creating the basis for scar formation.

Early Tangential Excision of Burn Wounds;

It has long been thought that the burn eschar was a protection against infection. This is still practiced in many places by using gentian violet or mercurochrome as the drying agent and thick scar is produced. However, the realization that eschar is dead tissue and equivalent to dry gangrene, led to the technique of early excision, or shaving off the eschar, to produce a clean bleeding wound, before the natural separation between dead and living tissue took place. This procedure allows the surgeon to remove the dead tissue and preserve viable, bleeding dermis. Jackson[28] stated that if the skin was obviously charred, the excision was done as early as possible.

In a full thickness burns, this involves excision of all layers of the burned skin, but in a deep partial thickness burn, it has been found that shaving off the burned layers of the skin, until pinpoint bleeding occurs, is sufficient. This procedure is done with a skin graft knife or dermatome and is called tangential excision.

This often produces massive bleeding from the wound surface, Following tangential excision the burn wound must be covered with skin graft taken from the patient.

Early surgical excision and Grafting.

Surgical excision of the burns wound may be carried out in a variety of ways but the most common method is excision up to fascia.

Although early surgical excision and grafting has been repeatedly attempted in the 20th century the outcome was initially poor. Much improved understanding of the patho physiology of burns and the advancement of multiple intra and postoperative medical and surgical techniques that have resulted in gradual decrease in morbidity and mortality.

The primary aims of early release are,

(1) Release the tourniquet effect of eschar on the upper eye lid.

(2) Removal of the dead tissue which stimulates an overwhelming systemic inflammatory response syndrome

(3) Prevention of infection by early cover of burn wound,

(4) Shortening the period of wound inflammation.

(5) Prevention of hypertrophic scar.

(6) Optimize the outcome in terms of function.

Skin Grafting (21)

All burns that take longer than 6 weeks to heal needs to be skin grafted. For a skin graft to take, the patient should have a haemoglobin level of at least 10gm%. The patient must be well nourished (at least maintaining or gaining weight) and be free from infection. If infection is present the bacterial colony count must be less then 10 to the power of 5per gm. Area to be skin graft needs to be covered with healthy granulation tissue.

The skin grafts can be applied in the following manner

a. stamp graft

b. sheet graft.

Donor sites

The scalp is the good donor site for skin graft harvesting and eyelid grafting. Other donor sites are thigh, post auricular, upper arm and supra clavicular region. An electric dermatome is the easiest instrument used to take a skin graft. But the hand-held skin graft knife with an adjustable guard is the most commonly used dermatome. This is commonly used to take the skin graft from the donor site, which is greased, and stretched tight. The skin graft is cut by a ‘to and fro’ motion. When a skin graft knife is not available, then

small graft can be taken with a scalpel or any sharp knife or razor blade. Scalp graft gives better results.

Reconstructive Goals are; (12**)**

Prevention of scar contracture and blindness. Attain a pleasing height and contour of upper eyelid,

Place the surgical incision along the natural skin line.

Avoid pitfalls that can tether the lids, such as suturing the septum or levator.

Restore normal lid function.

Use the skin that closely matches the eyelid skin when performing skin graft.

Acute Management

The patients in shock or within the critical level of shock are treated in the intensive care unit.

The following plans are commonly carried out in our centre

1. Patient are admitted in Burns Intensive care ward on sterile sheet.

2. Fluids therapy started with parkland formula.

3. I.V.Sedation is given.

4. Urinary indwelling catheter passed.

5. Prophylaxis against Tetanus given.

6. Antibiotics are started, relevant to the drug resistant & sensitivity of the previous month culture & sensitivity report and analysis.

7. Airway maintained.

The eyes are rinsed with saline to free them of any foreign materials.

Preoperative preparation for surgical procedure

The following principles were strictly followed as guidelines.

1. Thorough preoperative ophthalmologic examination is done and documented

2. All reconstruction begins with thorough evaluation of the defect and function of the eyelid. Component that have been compromised as well as those that remain viable including elements of skin muscle tarsus and conjunctiva are properly identified and documented.

3. We avoid dead space and hematoma formation

4. Suture materials and knots are placed in an effort to avoid direct contact with the surface of the cornea and globe.

5. Surgery done under I.V anesthesia.

Our prime aim is to avoid development of ectropion. In this connection first as the operating surgeon we observed all time honored standards.

Post operative wound infection is prevented by strict aseptic principles like meticulous preparation of the patient, proper sterilization of theatre and instruments and judicious use of antibiotics.

MATERIALS AND METHODS

In our study we have included 20 patients with deep partial thickness and full thickness upper eyelid burns cases examined & admitted at Burns, plastic & Reconstructive surgery department Kilpauk medical college and hospital Chennai- 10, between September 2006 to March 2009. A detailed history was taken with reference to the presenting complaint of the patient, the cause and duration and any previous treatment taken for it.

All patients underwent through clinical examination. Both eyes are examined, properly documented and photographs are taken.

Inclusion criteria ,

1. Patients with deep partial thickness and full thickness upper eyelid burns.
2. Eye lid burns with less then 50 % of the total body surface area burns,
3. Upper eye lid burns with out major corneal complications are included.
4. Upper eyelid burns due to flame burns and acid burns

Exclusion criteria

1. Upper Eye lid burn with more then 50% of the total body surface area burns.

2. Upper Eye lid burn with Epidermal and superficial partial thickness burns.

3. Upper Eye lid burn Patient with associated systemic disease like Diabetes, Hypertension, and severe systemic illness.

4. Upper Eye lid burn with age less then 13 and age more then 60 are excluded.

5. Upper Eye lid burn with previous ocular surgery.

6. Upper Eye lid burn with severe respiratory burns.

Eyelid burns early release and collagen sheet applied on admission and on 6 th post burn day split thickness skin graft was applied. The split thickness skin grafts used for early grafting.

All eyelid surgeries were done in our Burns operation theatre. Prior to surgical procedure comprehensive evaluation of whole body including opposite eye has been done. Basic investigations like blood sugar, urea, wound swab and culture have been taken. Ophthalmologist opinion was obtained. Preoperative counseling has

FIG. 3

(a)

Release incision

(b)

Collagen Application

(c)

SSG

(d)

Dental Mould Tie Over

(e)

One week

(f)

After two week

been done with patient and spouse and consent for surgery has been obtained.

Acute management in eyelid burns

The initial management of eyelid burn is directed to protect the cornea. Initial management started with, thorough washing of the eyelid and eye with running water and gentle eyelid and eyelash cleaning to prevent crusting. Singed lashes and eyebrows hair indicates thermal damage and this lash particle produces FB sensation to the eye. The lashes are lubricated with ointment. We thoroughly examine the eye by averting the eyelid and remove any remaining FB and chemical particles from the conjunctiva and eyelids. Antibiotic ointment and artificial tears and cycloplegic drops were applied.

Early release of upper lid burns,

As soon as the eyelid burns patient general condition improved, in the burns intensive care ward itself, under aseptic precaution with local Anaesthesia horizontal release incision was made from 5-8 mm medial to medial cantus to 5mm lateral to lateral cantus and 6-8 mm above the eyelid margin (Fig.3a) to release the full thickness burnt tissue. Haemostasis secured. Dry collagen sheet was applied immediately (Fig.3b). Collagen covering of the wound decreases the desiccation of delicate eyelid structures pain, fluid and temperature loss. Also protect the critical underlying structures.

Surgical management of eyelid burns; 6-10 post burn day.

Patients face and eyelids are cleaned with normal saline; the conjunctiva and fornix are washed with saline. Antibiotic eye ointment was applied to both eyes. The lights were switched on, Stay sutures was applied with 5 -0 prolene. Horizontal incision was made 6-10mm above the lid margin from the medial canthus to lateral canthus. The burned out tissues was completely excised. During excision not only the obvious defect but also the unhealthy epithelium covered areas also excised.

Eyelid release was done till the upper eyelid margin overlies the lower eyelid margin. The defect size is assessed. Overcorrection (nearly one and half times more) was done. The split thickness skin graft was harvested from inner aspect of upper arm or scalp. The graft was spread over the saline gauge. Hemostasis secured at recipient site. The required length and width of the harvested split thickness skin graft applied to the defect. Fixed with 6-0 silk/catgut (Fig.3c). Non adherent gauge, two layers of dry gauge, dental compound mold (Fig.3d) and tie over dressing was done. At the donor site complete hemostasis secured, non adherent gauge and double layer of dry pad and bandage applied. Dental mold Splint applied per operatively.

Postoperative management

Ist look dressing was done on the third post operative day. We have removed the outer layer dressing and cleaned the eye. IInd look dressing was done on the 5thPostoperative day we removed the suture, and clean the eyelids and eye. In the post operative period oral analgesics, antibiotic were given. Topical antibiotics ointment was applied.

Physiotherapy to minimize the Development of Eye lid Contracture,

By encourage the patient to be as independent as possible. By educate (staff, patients and relatives) all about burn contractures and how to prevent them and by practicing good scar care. The first few days, during the resuscitation period by head end elevation to reduce the eyelid edema. In the post operative period by head elevation, early functional activities, Scar massage, splint and pressure

An effective splint needs to be strong, light and comfortable, and preferably washable. Splinting was done with dental compound fabricated according to patient eyelid this was retained with micro pore plaster. Splinting was retained for 2 weeks.

Post operative complications

Most of the complications are minor in nature, and many of them are comparatively simple to manage.

Seroma - Collection of serous fluid in the recipient site. Our management consists of aspiration under aseptic condition when the collection is large and trouble some. Smaller collections are allowed to disappear spontaneously.

Haematoma - This is collection of blood in the grafted area obviously as a result of imperfect hemostasis. Hematoma was evacuated under strict aseptic technique.

Wound infection - wound infection is a substantiated threat to the successful repair of eyelid reconstruction. We drained the wound and the material was sent for culture & sensitivity and appropriate antibiotics were started.

Graft loss- minimal graft loss was present in three patients. Repeat grafting done for two patients.

FIG.5. CASE I

(a)

Release And Collagen Application

(b)

Excision

(c)

SSG Application

(d)

After two months

(e)

After One week

(f)

Dental Mould Splint

OBSERVATION

Total number of burn patient treated: 4819.

20 cases of upper eyelid burns were selected for release and grafting.

17 cases were flame burns and 2 cases were acid burns one case of scalds injury

All cases that were taken up for study were free from co morbid conditions like diabetes mellitus, IHD, renal, liver pathology. All cases taken up for study were present with the complaints of inability to open the eyelid because of edema

Symptoms of corneal irritation conjunctival congestion were noted in 18 cases.

There was no limbal ischemia even in acid burns. Anterior chamber, pupil, fundus were normal in all the cases.

There was no punctual obstruction or cicatrisation.

All cases were evaluated by ophthalmologist. In all our cases because of oedema of eyelid initial evaluation of vision was not possible.

FIG.6. Case No.II

(a)

Release And Collagen Application

(b)

SSG and Tie Over

(c)

After One week

(d)

After two months

All cases were under systemic antibiotic cover, anti inflammatory and analgesics.

All cases had topical antibiotic eye drops

All the procedures were done under IV anesthesia.

Donor site of skin graft was upper arm in 10 cases and thigh in 10 cases.

100% skin graft take in 17 patients. .

Donor site healing was completed in 10days no donor site morbidity was observed.

There was no injury to the eye in any of the cases. Comparison of eyelid movement and this ability to constantly close the eyeball was studied.-was equal in both eyes post operatively. Postoperative eyelid functions assed by clinically and found to be normal and adquate. Follow up was done for two months to one year there was 2 cases shows secondary contraction. Out of 20 cases, 2 cases developed ectropion. And one patient developed corneal ulcer and corneal opacity. One patient expired after two month due to systemic causes.

There was no evidence of exposure keratitis in 17 patients.

FIG 9. CASE IV

(a)

Release incision

(b)

Excision

(c)

SSG Application

(d)

After 3 month

(c)

Dental Mould splint

(d)

Micropore strapping

Aesthetic appearance of the eyes with respect to color match size and shape of the eyelid was good in 18 cases.

Occurrence of burn; 85% burn cases are domestic. 5 % of burn was in work spot and 10 % of burn injury from open space. 85% of burns are flame burn. 10% of burns were acid burns.5% burns due to scalds.

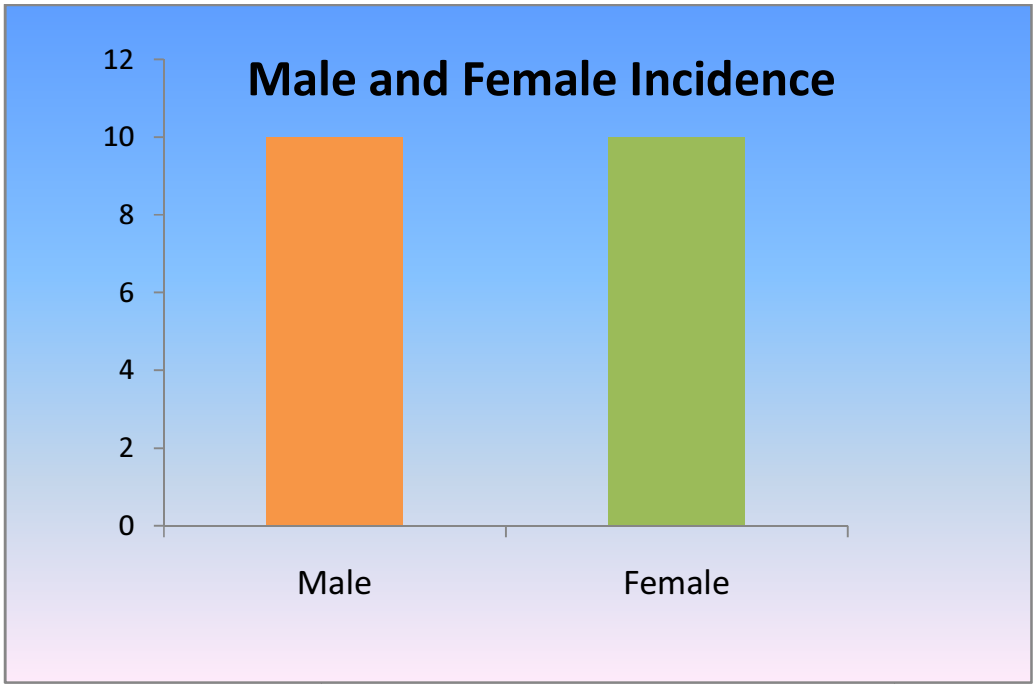
Type of burns; deep partial thickness burn of eyelid was in twelve patients and full thickness burn of eyelid was in eight patients. The procedure has been repeated in 15% cases. For one of the suicidal flame burn case the surgery has been done thrice because of her poor general condition. She had suicidal flame burn over the face. She had severe scarring of eyelid, neck and mouth. Second surgery was mostly done after a period of two month. Tarsorraphy was not done for any of our patient.

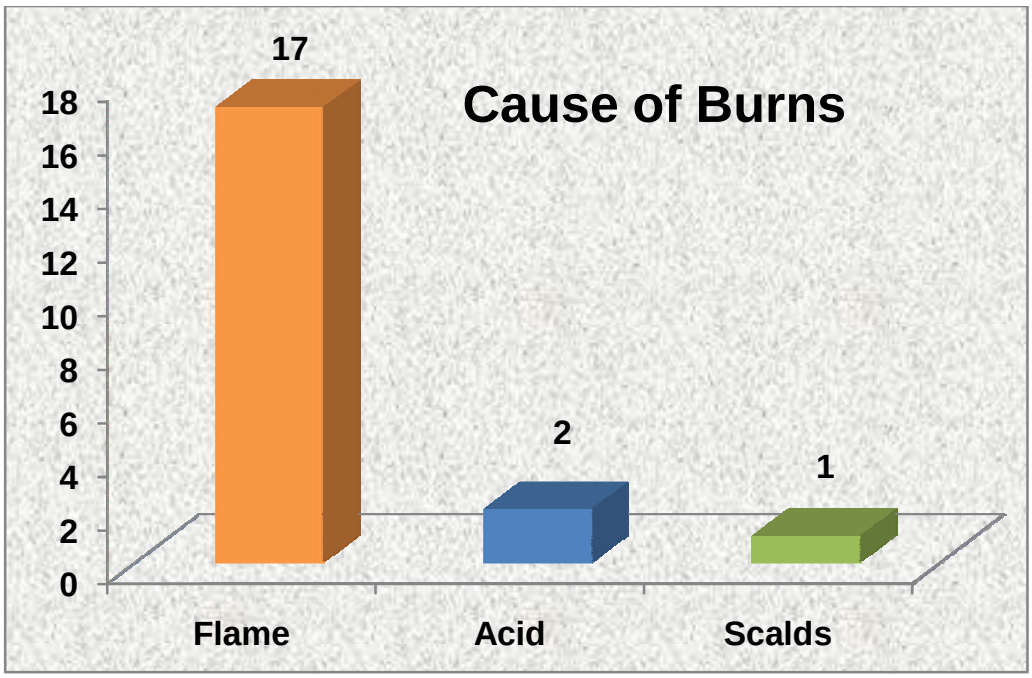
Incidence of Eyelid burns

Sex	No.of patients
Male	10
Female	10
Total	**20**

Sex incidence

In this study the incidence of burns was equal in females and males by a ratio of 1: 1. Various studies done earlier in KMCH have shown a higher incidence of flame burns in female.


Male and Female Incidence
12
10
8
6
4
2
0
Male
Female


Cause of Burns
18
16
14
12
10
8
6
4
2
0
17
2
1
Flame
Acid
Scalds

Causes of Burns

Accidental flame burns is a common cause in our study. 2 cases of acid burns and 1 case of Homicidal Scalds burns are present.

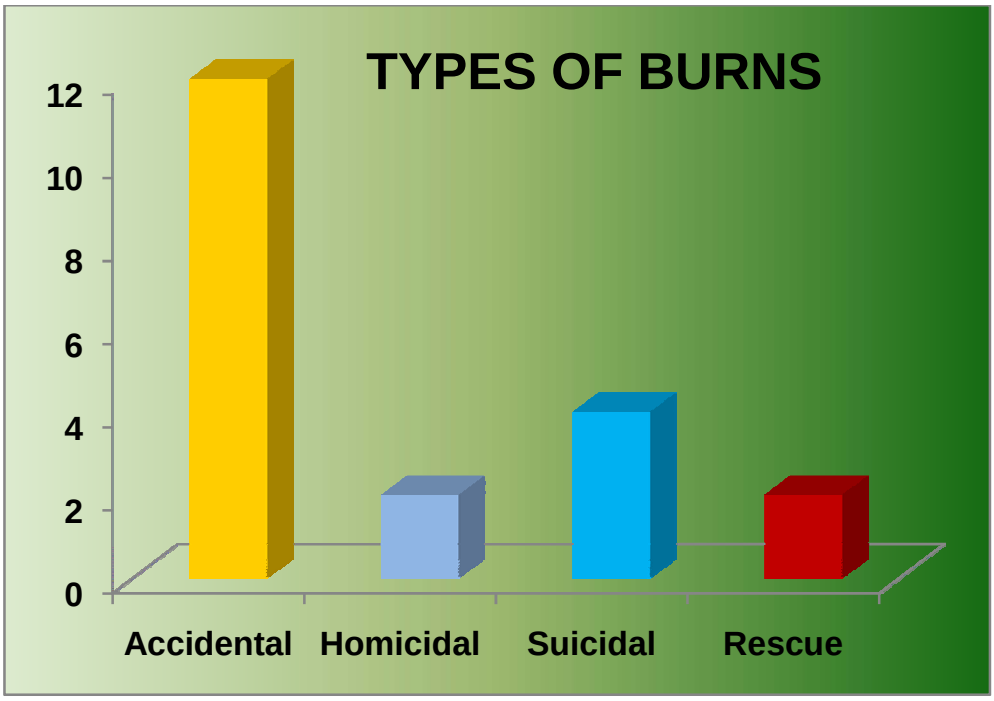
Causes of Burns

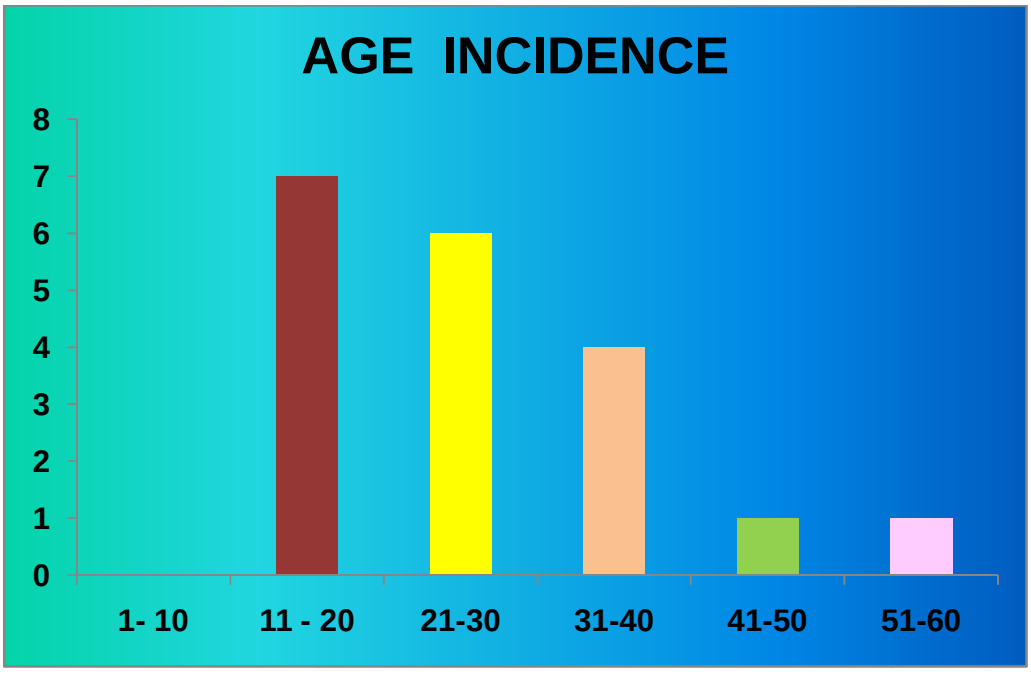
	Flame	**Acid**	**Scalds**
Male	7	2	1
Female	10	Nil	Nil
Total	17	2	1

Type of Burns

	Accidental	**Homicidal**	**Suicidal**	**Rescue**
Male	7	1	1	2
Female	5	Nil	4	-
Total	12	1	5	2

Accidental flame burns are the most common cause. Though many patients give history of accidental burns, further follow up by psychiatrist and social workers led to the finding that it was suicidal attempt.


TYPES OF BURNS
12
10
8
6
4
2
0
Accidental
Homicidal
Suicidal
Rescue


AGE INCIDENCE
8
7
6
5
4
3
2
1
0
1- 10
11 - 20
21-30
31-40
41-50
51-60

Age incidence

Age	1-10	11-20	21-30	31-40	41-50	51-60
Male	-	2	1	5	-	1
Female	-	3	7	1	-	-
Total	-	5	8	6	-	1

In this study the incidence of eyelid burn is more in the age group ranging from 21 to 40 years. This explains that middle age group patients are subjected to a greater risk for burns injury.

FIG.7. CASE III

(a)
Acid Burn 3rd Day

(b)
Release Incision

(c)
Collagen Application

(d)
Eschar Excision

CASE REPORTS

Case 1

This female patient admitted for 16% accidental flame burns of right eyelid. Early release was done on day 1 (Fig.5a) collagen applied immediately. On 7th post burn day excision (Fig. 5b) of the eyelid Escher was done up to orbicularis oculi muscle and skin grafting done with 0.018-inch skin from upper arm inner aspect. Fig.5c shows the patient 13 days after the injury, and Fig.5d shows her at 3 months after the injury. Eyelid functions are normal.

Case 2

This female patient underwent release of her Rt upper eyelid flame burns on 2nd post burn day (Fig.6a) dry collagen applied immediately. 6 days after injury her right eyelid burned tissue was excised up to orbicularis oculi muscle. Her left cheek and forehead were excised to dermis. She was grafted with 0.018-inch skin from her thigh. Fig.6b & c shows her 7 days after the injury, and Fig.6d shows her 4 months after the injury. Functions of the eyelid are normal.

FIG.8. CASE III

(a)
SSG Application

(b)
After One Month

(c)
After one week

(d)
After Two month

Case 3

This patient admitted for accidental acid burn injury on 3rd post burn day after initial treatment at some other hospital. Eyelid release was done Fig.7a & b on the same day. Collagen sheet applied immediately. After 10 days excision of the left eyelid eschar up to orbicularis oculi muscle was done (Fig. 7d). Grafting done with 0.018- inch STSG. Fig. 8c shows him at 9 days after the injury, and Fig. 8d shows him at 2 months after the injury. The eyelid function is adequate.

Case 4

This male patient was admitted for 28 % accidental flame burns. For Rt eyelid Early release was done on day 1.collagen applied immediately. On 14th post burn day excision of the eyelid eschar was done up to dermis and skin grafting (Fig. 9b & c)with 0.018-inch skin from right upper arm. Fig.9d shows her at 3 months after the injury. Eyelid functions are normal.

Case 5

This male patient was admitted for 11% suicidal burn. Early release was done on day 1 (Fig.10a &b) collagen applied immediately. On 14th post burn day excision of the eyelid eschar was done up to dermis and auto grafting with 0.018-inch Fig.10c. Figure shows the patient 13 days after the injury, and Fig.10d shows her at 1 month after the injury. Eyelid functions are normal.

FIG.10. CASE NO. V

(a)

Release incision

(b)

Collagen Application

(c)

SSG

(d)

After One month

DISCUSSION

The present study is based on the analysis of eyelid burn cases examined & admitted at Burns, plastic & Reconstructive surgery department Kilpauk Medical College and Hospital Chennai -10, during the period of September 2006 to March 2009 and the results are presented in this dissertation. During the period 4819 patients were admitted, this includes about 65 % of patients with more than 50% TBSA burns. Among the remaining 35 % of patients, 20 patients which includes either Rt or Lt side of upper lid were included in this study.

We have selected this study on upper eyelid burns, because of its functional importance in maintaining normal ocular function. Closure of the palpebral fissure is produced mainly by the downward displacement of the upper eyelid. The upper eyelid is responsible for moistening the cornea. In upper eyelid burns the potential for corneal dehydration is more.

Upper eyelid skin is more easily affected in flame and acid burns. Ectropion of the upper eyelid usually associated with constant danger of kerato conjunctivitis, corneal ulceration, scarring or perforation with loss of vision.

The upper eyelid with its attendant risks needs to be dealt with first to prevent irrepairable damage. One must remember that vision loss due to burns per se is rare except for chemical burns.

In our study we have operated one eye at a time, since operating on both the eyes together leads to temporary blindness due to dressings for a period of a week. This is highly distressing and frightening to any person with otherwise normal vision, more so in elderly and in children.

We are not operating on the ipsilateral upper or lower eyelids in single stage, because it fails to achieve the required over-correction in these cases.

The etiology of ocular burns seems to have a geographical basis. Indian studies have indicated Flame burns as a major cause.

In our study 12 patients had accidental flame burns injury due to stove burst while cooking. Accident at home forms the major bulk and common causes are due to wearing loose clothing like saree and dupatta.

Usually the large families live and cook in the same room. Even though there is a kitchen, it is small and ill designed. In rural areas most of the cooking is done at the floor level with stoves. The

storage shelves lie above the gas stove, so that while leaning to pick up an article from shelf, any loose garment can easily catch fire.

In rural areas the kerosene chimney lamps are used for illumination. They are made up of an ordinary glass bottle, thin tin cane with cotton wick. These lamps are kept in the floor or madam (Narrow shelf like space). They can be easily upset and result in fire especially during night sleep.

Two types of stoves are commonly available - LPG gas stove and kerosene stove. Gas stove mostly contain liquid petroleum gas (LPG). Two types of kerosene stoves are available: (28) the pressurized or the wick type. The pressurized cook stove is the offset burner type. The kerosene is delivered to the burner by an over-pressure in the fuel tank. The pressure is built up by a manual air pump. The fuel evaporates through an injector and is mixed with ambient air. This mixture is burnt and the form of the flame is determined by the design of the burner.

It is necessary to pre heat the burner in the beginning phase of cooking. A little bit of kerosene or sprit is burnt in the spirit cup under the burner. The power of the stove is regulated with a valve in the fuel pipe or by the pressure in the fuel tank. The flame is extinguished by closing the valve or by reducing the pressure on the

fuel tank. Some time the valve lumen may get narrowed by deposits and the victim use pin to de clog the already lighted pump stove.

This results in sudden spraying of kerosene under pressure on to the victims resulting more commonly in facial and upper limb burns.

Kerosene was the flammable liquid used in these stoves. Spilling and spraying of kerosene from pressure stove is more common cause. The jet of oil under pressure catches immediate fire.

"Wick" type Stoves consist of a base which contains kerosene. Multiple cotton thread wicks extend from the base to the upper chamber. An outside second chamber is used to protect the flames from the air. The exact mechanism of stove burst is not known, but it is thought that some of the kerosene in the lower chamber is converted into gaseous form, which suddenly escapes and catches fire, resulting in stove burst.

During this stove bursts the anterior parts of the body are involved (face, neck, front of chest, legs, arms, and hands). The lower abdomen and upper thighs are spared. The back is usually spared.

The background history of the burn is of utmost importance in such cases and may help in medico-legal aspects. If only the front parts of the body are involved, it may be a case of accidental stove

burst. But if the back parts or the whole body are affected, it may be a case of attempted homicide.

Careful handling of the stoves is of utmost importance and key to preventing an injury. Nearly all the burn patients in this study belonged to a low socio-economic category and they did not observe the necessary precautions when handling or using the stoves.

Our study also shows the accidents are usually due to the fact that the victims do not follow the instructions and do not observe the necessary precautions. In some cases, the stoves were refilled while still burning.

The companies that make these stoves do not always observe the due precautions and safety check-ups. These stoves provide a very cheap alternative to electric stoves, especially in low socio-economic groups.

It is common to heat water in a boiler with its lid in position. When the lid is handled the steam under pressure inflicts severe scalds of face, eyelids, neck and upper chest wall.

In all our patients due to reflective blinking and tight eyelid closure when the patient is exposed to flame or caustic materials, ciliary margin and deeper structure, i.e. tarsal plate are usually preserved.

In deep upper eyelid and forehead burns, intrinsic contraction of the burned eyelid results in shortening and tightening of the eschar bands in both horizontal and vertical direction. Due to significant eyelid retraction and immobility, accelerated by the forehead eschar, shortening of eyelid skin becomes evident as early as the third post burn day.

The inelastic, lid which is stretched tightly from medial to lateral canthus, produces a tourniquet effect, thereby compromising the venous and lymphatic efflux from the conjunctiva; The palpebral and bulbar conjunctival edema progresses, while the eyelid remain tightly retracted, resulting in the obliteration of the superior fornix. Ultimately, the conjunctiva prolapsed under the shortened eyelid becomes irreducible.

To avoid this complication supra ciliary incision was made on the upper eyelid extending 5 mm beyond the lateral canthus to 5 mm medial to medial canthus. The incision was carried down to the palpebral conjunctiva (21). This incision releases the strangulating tension imposed by the tight eschar band across the upper eyelid. Then the wound was covered with dry collagen sheet immediately.

Procedures like sequential facial excision are quite bloody. The most common cause for graft loss is bleeding. Grabb,[30] Jackson,[31] Cronin,[32] Converse,[33] recommended delayed grafting in such cases,

we have apply collagen dressings at the time of the release and auto graft later. Smahel[37] also reported that better skin graft “take” when grafts were placed on beds 48 hours old. In our study no graft loss was present due to bleeding.

We examined the eye daily especially when the patients were sleeping. Because when the patient is asleep the voluntary ability to close the lid is lost and the cornea is partially exposed this occurs, even in completely closed eyelids in daytime (McCarthy, 1990).

Long standing eyelid burns offers a challenge to the Burns reconstructive surgeon in various aspects, of which protection of the cornea and control of epiphora are the most important. Numerous techniques have been described for managing it surgically but not many reports are available in the literature regarding the efficacy of these procedures. The present study was aimed at assessing the commonly performed procedures namely early release and split thickness skin graft. In all our patients we have assessed the depth of burns on clinical ground. **(**13**)**

Most of our patients have developed severe facial and eyelid edema. This eyelid edema naturally protects the cornea during the initial post burn period. Because of this severe eyelid edema we could not assess the vision in the pre operative period.

The duration of Burns injury and surgical procedure in the present series ranged from 5 day to 10 days.

The presenting complaints in this series were photophobia, pricking sensation and watering from the eyes in 16 out of 19 patients, followed by inability to open the eyes in 19 patients.

We found in our pre-operative assessment a definite relationship between the extent of exposure keratitis and the degree of burns.

Though the release and skin grafting is ideal on third post burn day our patients had their surgeries from 5thpost burn day only. The delay was due to management of their other complication like shock and infection. But the day of surgery did not have any influence on the outcome of the graft take.

Management of burns with collagen was done by MathewB.Klein in the burns centre at Harboview medical center USA. They used Integra to cover the burns raw area after excision of burn eschar. They found that all patients had good color and texture match.

Our patients also underwent release of burns tissue and collagen application on first post burn day. Our study has shown that the eyelid release and immediate collagen cover will protect the eye

and also very helpful in providing a bed that was good for skin graft to take. The common cause of graft loss is bleeding. (Sequential facial excisions are quite bloody. Grabb,[30] Jackson,[31] Cronin,[32] Converse,[33] Have recommended delayed grafting in this cases, and for this reason, we elected to apply biologic dressings at the time of the release and auto graft later.).

Early excision significantly decreases wound colony count as the study of Juan P.Barrest and David Herndon. In our study also similar result present.

Zurada A; Zielinski A.& Lille, Sean T. M.D.; Engrav, Loren H. M.D.; Caps, Michael T. M.D., Orcutt, James C. M.D.; Mann, Roberta M.D. in their series demonstrates that the early grafting of eyelid burns with full -thickness graft, can prevent the development of recurrent cicatrical ectropion. Split-thickness grafting should be limited to cases where can not do full thickness graft.

Our series demonstrates that the early grafting of eyelid burns with split-thickness graft, (19) prevent the cicatricial ectropin. In our study 4 patients operated within 7 days of receiving eyelid burns and 16 patients operated with STSG cover of more than 7 days.

Whereas Barrow, Robert E. Ph.D.; Jeschke, Marc G.M.D.; series,17 had eyelid release within 7 days of receiving eyelid burns and 40 had a delay in eyelid release of more than 7 days after injury.

Corneal ulcers developed in 2 out of 17 of the early eyelid release almost equal to our series. Also suggest that early release and grafting should be the treatment of choice for with deep partial thickness and third-degree burns of the eyelids. Our present study almost correlates with the above findings.

Housinger TA, Hills J, Warden GD**.** In their study presents their experience with early excision and grafting. Sixty-six patients with a mean age of 6.2 years underwent early excision and grafting of eyelid & facial burns Patients underwent grafting a mean 12.7 days after burn. Procedures were done in two stages. In our series mean age of the patient is **25.** Early release and grafting of eyelid surgery done on (mean) **10.9** days after burn.

Tarsorrhaphy has been advocated for corneal protection in the past it does not prevent lid retraction in the long term and is not an appropriate substitute for timely skin grafting (Miller, 1979). Eyelid margin abnormality in tarsorahhaphy is more common. None of our patients underwent tarsorahhaphy.

Frank DH, Wachtel T, Frank HA, in their study said that tarsorrhaphies were found not to be useful in preventing ectropion. If the skin graft is applied in time there is no reason for corneal ulcers and opacities. Our present study correlates with the above findings.

Engrav and MDMatthias B. Donelan with their study mentioned that Excision and grafting has become the standard of care of acute burns

During the follow up period in eight of our 18 patients developed hypertrophic scar at lateral orbital junction. Five patients lost their eye brow hair. Post burn contracture neck was developed in twelve patients. Post burn contracture elbow was developed in six patients. Axillary contracture has developed in five patients. No donor site morbidity was noted in any of our patients.

CONCLUSION

1. Release incision and collagen application on the day of amission for deep partial thickness full thickness and chemical upper eyelid burn and early split thickness skin graft within 6-10 days prevent the post burn cicatricial ectropion.

2. It is a simple procedure to prevent the post burn cicatricial ectropion.

3. This procedure definitely prevent the period of wound inflamation and further complications.

4. This procedure optimize the eyelid function.

A deep partial thickness and full thickness burn of the eyelids will lead to development of contraction and cicatricial ectropion and subsequent exposure keratitis, followed by blindness. For this reason deep partial and full thickness eyelid burns should be grafted as early as possible.

The role of surgery in the treatment of those complex injury continue to evolve to incorporate refined concepts of tissue preservation, wound bed preparation and early attention to functional and aesthetic parameter. Social reintegration, psycho social support, and new pain control strategies have dramatically improved the quality of life for our patients during and after the acute course of care. In eyelid burn early release and grafting improved the ocular function.

DEPARTMENT OF BURNS, PLASTIC & RECONSGTRUCTIVE SURGERY

Kilpauk Medical College Chennai-10

Prof. S.R. VIJAYALAKSHMI, M.S., M.Ch., Plastic Surgery

PROFORMA

Name Age/Sex I.P.No

Address Occupation Date of Amission

Date of surgery

Date of Discharge

Referral Source

Date Of Injury

Etiology Of Injury Flame- Chemical- Contact Burns- Electrical Burns

Place Of Burns Domestic Open Space Working place

Circumstances Accidental Occupational Suicidal Homicidal

Type Of Burns Epidermal Super partial Deep partial Deep

Diagnosis

History a. Inability to Open the eye- RE LE

b. Bilateral/unilateral

Symptoms

a. Exposure Keratitis, Grittines, Watering, Irritation

b. Epiphora , Mild , Moderate , Severe

c. Corneal Staining

d. Anterior Segment : Limbal Ischemia , Anterior chamber , Pupil Fundus

e. Punctal Eversion : Normal apposed and not seen , Just seen, Everted

Vision : RE LE

Investigiation –BP : FBS/PPBS , lacrimal duct patency , Wound culture &sensitivity.

Other departmental consultations

Systemic & Topical Medication

Duration & Dosage

Surgery

Follow up : 2^{nd} day , 5^{th} day , 1 week , 2 week , 1 month

Post-op. Results : Keratitis , Epiphora , Ectropion , consmetic , Ptosis

Re-Surgery : Type of surgery , Time of surgery

BIBLIOGRAPHY

1. David N. Herndon , Total burn case 3rd issue.

2. Grabb Smith plastic surgery 5th edition .

3. Albert & Jakobiec: Principles and Practice of Ophthalmology, 2nd ed., Vol IV, W.B. Saunders Co., 1994.

4. Bosniak: Principles and Practices of Ophthalmic Plastic and Reconstructive Surgery, Vol I, W.B Saunders Co., 1996.

5. Duane's Clinical Ophtalmology – Eyelid abnormalities, Vol 5, Lippincott-Raven 1996.

6. Gholam A Peyman: Principles and Practice of Ophthalmology. Basic Oculoplastic Surgery Vol III, Jaypee Brothers, 1987

7. Kanski JJ: Clinical Ophthalmology: A Systematic Approach. Butterworth Heinemann, 4th ed., 1999.

8. Levine. MR. Manual of Oculoplastic Surgery, Churchill Livingstone 1988.

9. Smith B. Cherubini TD. Oculoplastic Surgery C.V. Mosby Co., 1970.

10. Stephenson CM: Ophthalmic, Plastic, Reconstructive and Orbital Surgery 1997.

11. Wolff's Anatomy of the Eye and Orbit, 8th ed., Chapman and Hall, 1997.

12. Artuson MG: the pathophysiology of severe thermal injury pathological aspects of the burns syndrome and alterations of capillart permeability,Acta Ccir.scand suppl 274 p 75,1961. and J Burn Care Rehabil 6:129,1985.

13. Heimbach D , Engrav L, Grube B, Marvin J: Burn depth: A review . World J Surg 16:10,1992.

14. Warden GD,Kraavitz M, Schnebly A : The outpatient management of moderate and major thermal injuries. J Burn Care Reh

15. Janzekovic Z: A new concept in the early excision and immediate grafting of burns. J Trauma 10:1103,1970.

16. Thompson P et al: Effective early excision on patients with major thermal injury . J Trauma 27:205,1987.

17. Jonsson CE, Dalsggard CJ: Early excision and skin grafting of selected burns of the face and neck. Plast Reconstr Surg 88:83,1991.

18. Fraulin FOG,Illmayer SJ , Tredget EE: Assessment of cosmetic and functional results of conservative versus surgical management of facial burns. J Burn Care Rehabil 17:19,1996.

19. Lille, Sean T.MD.;Engrav Loren H. MD., Roberta M.D., P & RSJ.104(3) : 637-645, September 1999.

20. J.L.Hunt,G.F. purdue , G.Bennett and S. Range burns volume 13,issue 1.Feb-1987,pages 39-44.

21. Barrow,Robert , Herndon, David N.MD. P&RSJ. 105(3):860-863,Mar-2000.

22. Cole,jana K.M.D.;Engrav, Betti A.O.T.R.; Nakamura , Carolyn L.R.N.P&RSJ. 109(4):1266-1273,Apr-1,2002.

23. Housinger TA , Hills J , Warden GD. Management of pediatric facial burns Burn Care Rehabil.1994 Sep-0ct;15(5):408-11.

24. Burn Wound Infections clinical Microbiology Reviews, April 2006,p. 403-434,Vol.19,N0.2.

25. Surgical management of deep chemical burns of eyelids. Klin Oczna . 2005;107(4-6):275.

26. Face burns : Acute care and reconstruction MDLoren H . Engrav et. Al University of Washington School of Medicine , operative Techniques in plasric and Reconstructive surgery volume 4. isssue2, May 1997, pages 53-85.

27. ZhannG Suny Yan B Management of deep facial burn with early postburn debridement and delayed skin grafting . Zhonohua Shao Shang Za , Zhi. 1001 Dec; 17(6):327-9.

28. Environmental Manual for Power Development Data Sources and Data Compilation for the Indian Data set documentation for the IndiaDatabase for the Environmental manual by **Niels Jungbluth 1** January 1995

29. Surgical management of deep chemical burns of the eyelids.polish. Zurada , Agnieszka: Zirlinski:Andizej. J .Burn Care & Research 107(4-6);275-7,2005.

30. Acute Burns , Burn Surgery , and Post burn Reconstruction John L Hunt D, Gary F purdue MD , and Ross I S Zbar MD.

MASTER CHART

S.No	Name	Sex/Age	Ip.No	Cause	TBSA	RIGHT /LEFT	DOA	DOS	DURATION	Post of Complication	Physio theraphy	Remarks
1	Iyappan	34/M	510/08	CB	34%	LUL	9.4.08	23.4.08	13th	Nil	Yes	Rec
2	Murugan	35/M	1280/08	SCALDS	36%	LUL	25.8.08	10.9.08	15th	Nil	Yes	-
3	Sembaruthi	13/F	1561/08	SB	28%	RUL	11.10.08	20.10.08	10^{th}	Rec	Yes	Rec
4	Pachaiammal	27/F	21926	AB	28%	RUL	1.11.08	4.11.08	5th	Nil	Yes	-
5	Vijaya	24/F	23571	SB	22%	RUL	11.11.08	19.11.08	9 th	Nil	Yes	Rec
6	Kamarunnisha	27/F	1826/08	SB	40%	RUL	25.10.08	05.11.08	11th	Nil	Yes	-
7	Kamatchi	17\M	25529	AB	34%	LUL	24.11.08	3.12.08	10th	Nil	Yes	-
8	Santhosh	18\M	25737	ARB	15%	RUL	27.11.08	3.12.08	7th	Nil	Yes	-
9	Prabakaran	18\M	1892/08	ARB	33%	LUL	13.12.08	17.12.08	5 th	Nil	Yes	-
10	Jamuna	22\F	1985\08	AB	36%	LUL	28.12.08	6.1.09	10 th	Nil	Yes	-
11	Kaniyappan	32\M	95809	AB	33%	RUL	16.1.09	30.1.09	14th	Nil	Yes	-
12	Bakiyavathi	18\F	156/09	AB	34%	LUL	26.1.09	4.2.09	10th	Nil	Yes	-
13	Anadhan	27/M	59\09	SB	10%	LUL	26..1.09	4.2.09	10th	Nil	Yes	-
14	Gowri	20/F	193/09	AB	16%	RUL	1.2.09	9.2.09	9th	Nil	Yes	-
15	Dillibabu	30\M	247/09	AB	11%	LUL	7.2.09	12.2.09	5th	Nil	Yes	-
16	Sivanantham	27\M	378\09	CB	22%	LUL	3.2.09	13.2.09	11th	Nil	Yes	-
17	Nirmala	24\F	179/09	AB	40%	LUL	30.1.09	15.2.09	16th	Nil	Yes	-
18	Bakiyam	32\F	3343	SB	16%	RUL	15.2.09	19.2.09	5th	Nil	Yes	-
19	Gunalan	51\M	291/09	AB	22%	LUL	16.2.09	25.2.09	10th	Nil	Yes	-
20	Davaselvi	27\F	5068	SB	34%	RUL	13.3.09	30.3.09	17th	Expir	yes	Expir

AB - **Accidental Flame Burns**
CB - **Chemical Burns**
SCALDS - **Scalds Burn Injury**