



EYELID RECONSTRUCTION AND ITS OUTCOME IN A TERTIARY CARE CENTRE – A CLINICAL STUDY

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ABSTRACT

Background: Eyelids protect the underlying globe from injuries and function in protecting the eye sight. Eyelid defects most commonly arise out of direct physical trauma followed by post-surgical excision of eyelid tumours and congenital anomalies in that order. The goals of Eyelid Reconstruction are corneal protection, restoration of integrity of eyelid lamella and achieving facial symmetry. The choice of procedure depends on the site, size and extent of the defect. The most commonly done reconstructive procedures are direct closure with or without lateral cantholysis, grafts and flaps.

Objective: To study the eyelid defects due to various causes and to assess the functional outcome of various Eyelid Reconstructive procedures.

Materials and Methods: This is a hospital-based, Prospective Interventional study of 25 patients presenting with eyelid defects due to various causes in the outpatient services of Ophthalmology Department at Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, from October 2018 to September 2020. Eyelid reconstruction was done for lid laceration, post-surgical excision of eyelid carcinoma and cysts, ectropion and entropion. Post-operatively, the eyelids were examined for movement, lagophthalmos, notching, ptosis, ectropion/entropion, retraction, infection, scarring and need for revision surgery in each case.

Results: Out of 25 patients, 21 (84%) were males and 4 (16%) were females. Most common age group was 21-30 years (24%). Right eye was involved in 13 cases (52%) and left eye in 12 cases (48%) and involvement of upper eyelid (48%) and lower eyelid (44%). Most common clinical diagnosis was eyelid laceration (52%) followed by eyelid cysts (28%). Most common reconstructive procedure done was primary closure (52%) followed by excision biopsy (32%). The complications encountered during the immediate post-operative period were dry eye (4%), hematoma (4%) and ptosis (4%). Most common post-operative complication after 2 weeks was ectropion (8%).

Conclusion: The most common cause of eyelid defect is trauma. The most common eyelid reconstructive procedure done is direct closure. The common complications in the immediate post-operative period are dry eye, hematoma and ptosis and the most common post-operative complication after 2 weeks is ectropion. Reconstructive surgery should be planned accordingly after careful appraisal of eyelid defects.

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INTRODUCTION

Eyelids protect the underlying globe from injuries and function in protecting the eye sight. Eyelids are part of the lacrimal drainage unit that maintains the ocular surface integrity. Eyelid defects most commonly arise out of direct physical trauma followed by post-surgical excision of eyelid tumours and congenital anomalies in that order. It is important to identify the anatomical defect due to trauma or post-surgical excision of tumour, plan and reconstruct to restore the normal function of eyelids following repair.

Understanding in-depth knowledge about surgical anatomy of eyelids and the basic principles of repair and reconstruction of eyelids helps in preserving basic function of the eyelids such

as globe protection, mobility and tear drainage and helps in the best possible cosmetic and functional outcome respectively.

The goals of Eyelid Reconstruction are

- ✓ Corneal protection.
- ✓ Restoration of integrity of eyelid lamella.
- ✓ Achieving facial symmetry.

Inadequate reconstruction leads to lagophthalmos causing corneal exposure, keratopathy and ulceration eventually leading to blindness. In younger patients, visual deprivation and amblyopia may follow. Proper techniques will obviate

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most common post-operative complications like ectropion, entropion, ptosis, lagophthalmos and trichiasis.

The choice of procedure depends on the site, size and extent of the defect. Various reconstructive procedures are available including primary closure, grafting and a variety of local flaps¹. For a partial thickness defect, direct closure is tried first and flap/graft is used if required. Alternatively, the defect can be allowed to granulate and heal by secondary intention. For a full thickness defect, direct closure must be tried first and if required lateral cantholysis and flap/graft must be used appropriately².

A composite eyelid margin graft taken from a healthy eyelid should not exceed more than one-third of the eyelid margin length to allow for direct closure of the induced defect with good functional and cosmetic results. The purpose of this study is to describe new materials and approaches in the reconstruction of damaged eyelids.

Aims and Objectives

1. To study the eyelid defects due to various causes presenting in the Ophthalmology Department.
2. To assess the functional outcome of the various Eyelid Reconstructive procedures in the Ophthalmology Department.

MATERIALS

Study Design Prospective Interventional study.

Study Place Department of Ophthalmology, Rajah Muthiah Medical College and Hospital, Annamalai Nagar, Chidambaram, Tamil Nadu – 608002.

Study Duration 2 years (October 2018 to September 2020).

Target Population Patients with Eyelid abnormalities attending outpatient services of Ophthalmology Department at Rajah Muthiah Medical College and Hospital.

Study Population Subjects diagnosed to have Eyelid laceration, swellings, tumours and deformity attending outpatient services of Ophthalmology Department at Rajah Muthiah Medical College and Hospital.

Inclusion criteria

- ✓ Both male and female patients of all age groups.
- ✓ Eyelid injuries.
- ✓ Eyelid swellings and tumours.
- ✓ Ectropion, Entropion.

Exclusion criteria

- ✓ Orbital injuries involving head trauma, fractures.
- ✓ Penetrating ocular injuries.
- ✓ Critically ill patients, psychiatric patients.
- ✓ Ptosis.

METHODOLOGY

Patients with eyelid abnormalities attending outpatient services of Ophthalmology Department at Rajah Muthiah Medical College and Hospital were the target population. Based on the inclusion criteria, study population was selected. For patients presenting with lid laceration, their demographic data (age, gender, occupation, address), detailed history to know the mode of injury and duration between injury and presentation were noted. The eyelid defects were examined thoroughly in terms of its nature, site and extent. For patients presenting with

eyelid tumours, their clinical presentation and type of tumour were assessed and the reconstructive surgery post-excision was planned. Detailed ocular examination, assessment of visual acuity, slit lamp examination were documented. Immediate intervention was given for traumatic lid laceration. For elective cases, routine blood investigations, BT, CT, serology were taken. XR facial bones and CT Brain & Orbit were done in relevant cases.

After thorough evaluation, all the cases were posted under appropriate anaesthesia. Local anaesthesia was most commonly used with infiltration as the technique of choice. Lignocaine 2% was infiltrated via subcutaneous route directly into the surgical site. After obtaining consent for documentation, pre- and post-operative clinical photographs were taken. All the cases underwent appropriate eyelid reconstruction like direct closure, excision and flaps. These patients were followed up for 4 weeks.

Post-operative period All patients were put on topical and systemic antibiotics and anti-inflammatory agents. In the post-operative day 1, wound was cleaned and fresh dressing applied. The eyelids were examined for movement, lagophthalmos, notching, ptosis, ectropion/entropion, retraction, infection, scarring and need for revision surgery for each case.

Statistical Analysis

All the data were entered in Microsoft Excel Sheet. To describe about the data descriptive statistics, frequency analysis and percentage analysis were used for categorical variables and Mean & Standard Deviation were used for continuous variables. To find the significance in categorical data, Pearson’s Chi-squared test was used. In the above statistical tool, the probability value of 0.05 is considered as significant level.

Statistical Software: IBM SPSS Statistics Software 23.0 version.

RESULTS AND OBSERVATIONS

Demography

Total Study Population 25.

Age-groups present in the study 6-70 years.

Table 1 Comparison between Age and Clinical Diagnosis

		AGE				TOTAL
		Upto 20 years	21 - 40 years	41 - 60 years	Above 60 years	
Carcinoma	Count	0	0	0	2	2
	%	0.0%	0.0%	0.0%	40.0%	8.0%
Cyst	Count	0	3	2	2	7
	%	0.0%	30.0%	25.0%	40.0%	28.0%
Ectropion	Count	0	0	1	0	1
	%	0.0%	0.0%	12.5%	0.0%	4.0%
ENTROPION	Count	0	0	1	0	1
	%	0.0%	0.0%	12.5%	0.0%	4.0%
Laceration	Count	2	7	4	0	13
	%	100.0%	70.0%	50.0%	0.0%	52.0%
Naevus	Count	0	0	0	1	1
	%	0.0%	0.0%	0.0%	20.0%	4.0%
TOTAL	Count	2	10	8	5	25
	%	100.0%	100.0%	100.0%	100.0%	100.0%

The above table shows no statistically significant association between Age and Clinical Diagnosis by Pearson's Chi-squared test $\chi^2 = 21.223$, $p = 0.130 > 0.05$.

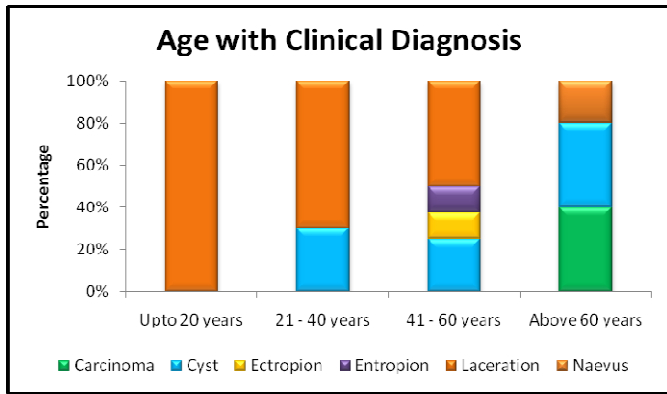


Figure 1 Comparison between Age and Clinical Diagnosis

Table 2 Comparison between Gender and Clinical Diagnosis

CLINICAL DIAGNOSIS		GENDER		TOTAL
		Female	Male	
Carcinoma	Count	1	1	2
	%	25.0%	4.8%	8.0%
Cyst	Count	2	5	7
	%	50.0%	23.8%	28.0%
Ectropion	Count	0	1	1
	%	0.0%	4.8%	4.0%
Entropion	Count	0	1	1
	%	0.0%	4.8%	4.0%
Laceration	Count	1	12	13
	%	25.0%	57.1%	52.0%
Naevus	Count	0	1	1
	%	0.0%	4.8%	4.0%
TOTAL	Count	4	21	25
	%	100.0%	100.0%	100.0%

The above table shows no statistically significant association between Gender and Clinical Diagnosis by Pearson's Chi-squared test $\chi^2 = 3.782$, $p = 0.581 > 0.05$.

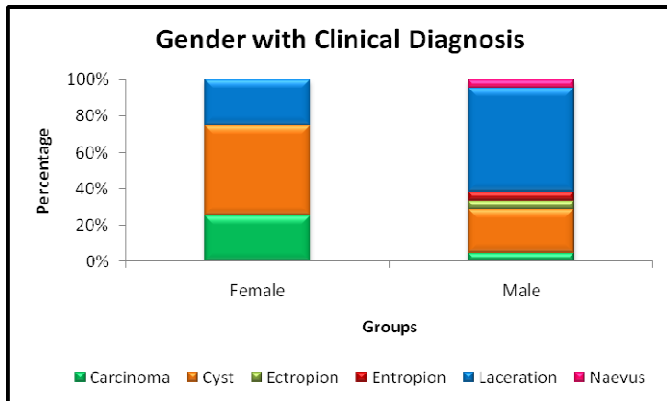


Figure 2 Comparison between Gender and Clinical Diagnosis

Table 3 Comparison between Eyelid and Clinical Diagnosis

CLINICAL DIAGNOSIS		EYELID			TOTAL
		BL	LL	UL	
Carcinoma	Count	1	1	0	2
	%	50.0%	9.1%	0.0%	8.0%
Cyst	Count	0	1	6	7
	%	0.0%	9.1%	50.0%	28.0%
Ectropion	Count	0	1	0	1
	%	0.0%	9.1%	0.0%	4.0%
Entropion	Count	0	1	0	1
	%	0.0%	9.1%	0.0%	4.0%
Laceration	Count	1	6	6	13
	%	50.0%	54.5%	50.0%	52.0%
Naevus	Count	0	1	0	1
	%	0.0%	9.1%	0.0%	4.0%
TOTAL	Count	2	11	12	25
	%	100.0%	100.0%	100.0%	100.0%

The above table shows no statistically significant association between Eyelid and Clinical Diagnosis by Pearson's Chi-squared test $\chi^2 = 13.268$, $p = 0.209 > 0.05$.

Table 4 Comparison between Surgical Procedure and Clinical Diagnosis

CLINICAL DIAGNOSIS		SURGICAL PROCEDURE						TOTAL
		EB	MWP	PC	WLE + OFF	WLE+MG-RFS	ZP	
Carcinoma	Count	0	0	0	1	1	0	2
	%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	8.0%
Cyst	Count	7	0	0	0	0	0	7
	%	87.5%	0.0%	0.0%	0.0%	0.0%	0.0%	28.0%
Ectropion	Count	0	0	0	0	0	1	1
	%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	4.0%
Entropion	Count	0	1	0	0	0	0	1
	%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	4.0%
Laceration	Count	0	0	13	0	0	0	13
	%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	52.0%
Naevus	Count	1	0	0	0	0	0	1
	%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%
TOTAL	Count	8	1	13	1	1	1	25
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The above table shows highly statistical significant association between Surgical Procedure and Clinical Diagnosis by Pearson's Chi-squared test $\chi^2 = 100.00$, $p = 0.0005 < 0.01$.

[EB – Excision Biopsy; PC – Primary Closure; MWP – Modified Wheeler's procedure; WLE + MG-RFS – Wide Local Excision + McGregor's Rotational Flap surgery; WLE + OFF – Wide Local Excision + Oblique Forehead Flap; ZP – Z-plasty].

Table 5 Tear Film Break-Up Time Distribution

T-BUT (secs)	FREQUENCY	PERCENT
8	1	4.0
11	2	8.0
12	5	20.0
13	5	20.0
14	3	12.0
15	9	36.0
TOTAL	25	100.0

The above table shows T-BUT distribution: 8 secs (4.0%), 11 secs (8.0%), 12 secs (20.0%), 13 secs (20.0%), 14 secs (12.0%), 15 secs (36.0%).

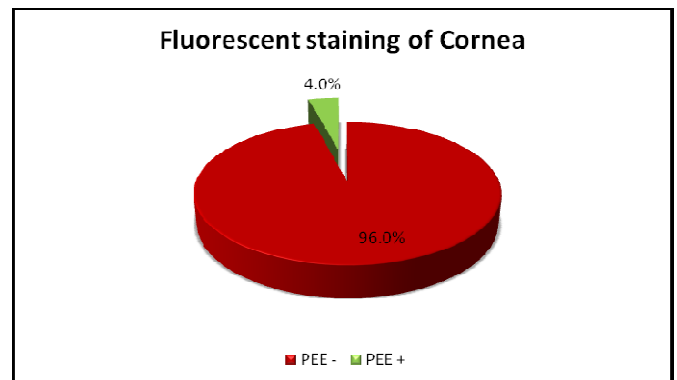


Figure 3 Fluorescent Staining of Cornea Distribution

The above figure shows Fluorescent staining of Cornea distribution: PEE - (96.0%) and PEE + (4.0%).

Table 6 Conventional Schirmer I Test Distribution

CST (mm)	FREQUENCY	PERCENT
7	1	4.0
12	2	8.0
13	1	4.0
14	4	16.0
15	5	20.0
16	6	24.0
17	4	16.0
18	2	8.0
TOTAL	25	100.0

The above table shows Conventional Schirmer I test distribution: 7 mm (4.0%), 12 mm (8.0%), 13 mm (4.0%), 14 mm (16.0%), 15 mm (20.0%), 16 mm (24.0%), 17 mm (16.0%), 18 mm (8.0%).

Table 7 Post-Operative Day 1 Complications

POST-OPERATIVE DAY 1	FREQUENCY	PERCENT
Dry eye	1	4.0
Hematoma	1	4.0
Ptosis	1	4.0
No complication	22	88.0
TOTAL	25	100.0

The above table shows Post-operative day 1 complications: Dry eye (4.0%), Hematoma (4.0%), Ptosis (4.0%).

Table 8 Comparison between Clinical Post-Operative Assessment after 2 weeks and Outcome

			OUTCOME		TOTAL
			Fair	Good	
CLINICAL POST-OPERATIVE ASSESSMENT AFTER 2 WEEKS	Ectropion	Count	2	0	2
		%	100.0%	0.0%	8.0%
	Resolved immediate post-op complication	Count	0	3	3
		%	0.0%	13.1%	12.0%
	No Complication	Count	0	20	20
		%	0.0%	86.9%	80.0%
TOTAL	Count	2	23	25	
	%	100.0%	100.0%	100.0%	

The above table shows highly statistical significant association between Clinical postoperative assessment after 2 weeks and Outcome by Pearson's Chi-squared test $\chi^2 = 25.00$, $p = 0.0005 < 0.01$.

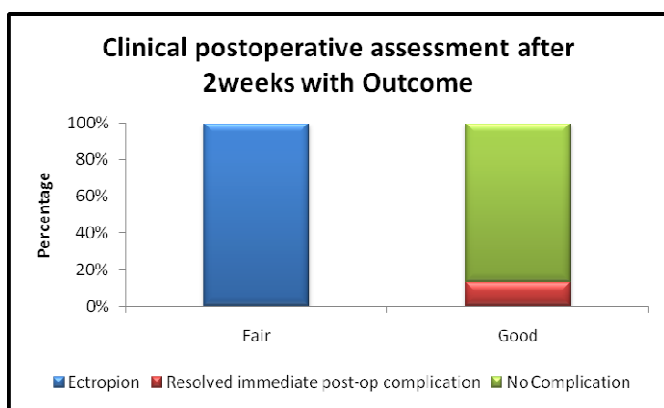


Figure 4 Comparison between Clinical Post-Operative Assessment after 2 weeks and Outcome

DISCUSSION

In our study, 25 cases of eyelid defects were studied and reconstructive procedures were done in the Department of Ophthalmology at Rajah Muthiah Medical College and Hospital. The following observations and analysis were noted during the course of study.

Eyelid trauma and post-surgical excision of eyelid tumour are the two most common causes of eyelid defects which require repair and surgical reconstruction. Different techniques are available for eyelid reconstruction. Several factors must be carefully analyzed pre-operatively since they affect the surgical outcome. They include size and orientation of the defect, vascular supply to the adjacent tissues, biologic behaviour of the swellings and tumours, age of the wound, previous treatment.

Age and Gender Distribution

All age groups were included in the study. The youngest patient was a 6-year-old boy and the oldest patient was a 70-year-old man. The most common age group involved was between 21 to 30 years of age with 6 patients (24%) and the least involved age groups were <10 years and 11 to 20 years with 1 patient (4%) each.

Based on gender distribution, males were most commonly involved with 21 patients (84%) and females with 16%.

Laterality

Right eye was most commonly involved with 13 patients (52%) and left eye was involved with remaining 12 patients (48%).

Lid Distribution

Upper eyelid was most commonly involved in 48% of cases, lower eyelid in 44% and both eyelids in 8%.

Clinical Diagnosis Distribution

The most commonly operated case was lid laceration accounting for 52% followed by cysts (28%), carcinoma (8%) and ectropion, entropion, naevus (4%) each.

Swellings of Eyelid

Carcinoma of Eyelid

Of 2 cases of carcinoma of eyelid, 1 was Sebaceous Gland Carcinoma of lower eyelid and another was Basal Cell Carcinoma of both eyelids and medial canthal area.

Sebaceous Gland Carcinoma (SGC)

The Sebaceous gland carcinoma was a solitary nodular swelling involving lower eyelid. According to a study by **Putterman AM**, the most common presentation of SGC is in the form of a nodule and ulcerative growth³. The patient underwent Wide local excision with adequate tumour margins. Reconstruction of the inverted-house shaped eyelid defect post excision was managed by a McGregor's Flap which is a transposition advancement flap. A Z-plasty was added laterally to reduce the tension and to improve the scar appearance. Histopathological report was consistent with Well Differentiated Sebaceous carcinoma.

In the immediate post-operative period, the patient developed Dry eye with T-BUT of 8 secs, Conventional Schirmer I test value of 7 mm and Fluorescent staining of Cornea revealed few Punctate Epithelial Erosions. This was similar to a study by **Hafez Amr** in which 2 patients developed PEE post blepharoplasty⁴. It resolved spontaneously after 2 weeks with topical lubricants and antibiotics. Post-operatively, the flap was healthy and the reconstructed eyelid had a stable lid margin and in contact with the globe's curved surface.

In our study, the patient was a 65-year-old female. Similarly, in a study by **James T. Wolfe**, SGC occurs most often in women in the sixth to eighth decade of life. Also, in contrast to our study, SGC arises slightly more frequently in the upper eyelid than in the lower eyelid, a finding that corresponds to the distribution of normal meibomian glands⁵.

Basal Cell Carcinoma (BCC)

Another case was Basal Cell Carcinoma which was a pear-shaped solitary ulcer involving both eyelids and medial canthal area and extending upto the upper 1/3 of the lateral aspect of nose. Most common presentation of BCC is in the form of ulcer⁶. Wide local excision with Median forehead flap which is a versatile flap for reconstructing upper, lower or both eyelids and the medial canthal areas, was done. The flap was raised from the centre of the forehead. The donor area was closed directly. Histopathological report was consistent with Pigmented BCC. Post-operative period was uneventful with the flap well taken and healthy.

Intraocular invasion of BCC is rare though it invades the eyelids and orbit. Metastasis is uncommon and rarely fatal. The gold standard surgery for complete excision of tumour is Mohs micrographic surgery⁷. The eyelid must be reconstructed with standard oculoplastic procedures following excision of tumour. For patients who are poor candidates for surgery, Cryotherapy is a good choice for treatment of periocular nodular or nodulo-ulcerative BCC⁸.

In our study, the mean age of patients with malignant tumours was above 60 years which is in agreement with studies by **Vitaliano** and **Urbach**⁹.

Cysts of Eyelid

Of 25 cases, 7 cases (28%) were Cysts. Among them, 3 cases were Dermoid cysts, 2 Sebaceous cysts, 1 Tear cyst and 1 Meibomian cyst and most cases were in the age group of 21 to 40 years (43%). Most of the cases were males (71%) and most of it involved the upper eyelid (85%). This is similar to a study by **Abbas Bagheri et al** where it is stated that Dermoid cyst predominantly involves the upper eyelid¹⁰. Excision Biopsy was done in all the cases. Post-operative period was uneventful.

Naevus

1 case of Melanocytic Naevus was studied which presented as a single pigmented nodular swelling in the lower eyelid. Simple excision biopsy was done. Histopathological report revealed nests of melanocytes in the upper mid-dermis and was consistent with Intradermal Naevus. According to a study by **Mi Jung Chi**, Intradermal naevus was the most common benign eyelid tumour among Melanocytic Naevi and the histopathology showed nests of naevus cells in the upper dermis¹¹.

Lid Laceration

Our study included 13 cases of eyelid injuries of which 92% were males and remaining 8% were females probably due to better access to hospitals and males being economically independent than females in our society. In our study, the most common cause of acquired eyelid defect was trauma similar to the findings observed by **Subramanian N** in which eyelid defects that needed reconstruction were done to post trauma patients predominantly¹².

These 13 cases included both partial and full thickness laceration. Most of the cases were in the age group of 21 to 40 years. The most common cause was trauma due to road traffic accidents. Lower eyelid and upper eyelid were involved in 6 cases each and both eyelids were involved in 1 case. 9 cases of partial thickness laceration were involved with the remaining 3 cases being full thickness laceration.

Full thickness laceration was sutured carefully by 3 layers giving importance to proper suturing of tarsus and good alignment of grey line. In the immediate post-operative period, 1 patient developed mild Ptosis due to eyelid edema causing mechanical restriction to eyelid elevator muscle action which resolved spontaneously after 2 weeks with conservative management. According to **Francis G. Wolfort**, mild ptosis post blepharoplasty may resolve spontaneously¹³. After 2 weeks of post-operative period, 2 patients developed Ectropion and underwent Z-plasty revision surgery. According to **Salvador Castanares**, Ectropion is the most common serious complication post blepharoplasty¹⁴. Further follow up was uneventful.

Partial thickness laceration was directly sutured with 5-0 prolene. 1 case developed Hematoma in the immediate post-operative period due to bleeding under the suture line which resolved spontaneously after 2 weeks with conservative management. This was similar to a study by **Patrocínio, Tomas Gomes et al** in which 1 case developed hematoma post blepharoplasty¹⁵.

Since most patients were treated on an out-patient basis it was difficult for proper follow up and evaluation of complications.

Entropion

1 case of Senile Entropion was studied with complaints of corneal irritation for which Modified Wheeler's procedure was done without any complications. Post-operative period was uneventful.

Modified Wheeler's technique creates a mechanical barrier to prevent the over-riding of the pre-septal orbicularis oculi and tarsal resection corrects the horizontal laxity. In a study by **Olali et al**, the Modified Wheeler's technique showed to be a safe, simple and effective surgery with good post-operative results¹⁶.

Ectropion

1 case of lateral cicatricial Ectropion was studied and Z-plasty was done. In this case, the incision was given along the scar and the scarred tissues were excised. 2 incisions were made at 60° from the line of excision of the scar to fashion a Z. Dissection was done beneath the flaps to release the traction forces sufficiently and the flaps were reversed to make a reverse Z and sutures were applied. This was similar to a study described by **Gaurav Sharma**¹⁷. Post-operative period was uneventful.

CONCLUSION

The most common cause of eyelid defect is trauma. The most common eyelid reconstructive procedure done is direct closure. The common complications in the immediate post-operative period are dry eye, hematoma and ptosis and the most common post-operative complication after 2 weeks is ectropion.

Direct closure, Excision Biopsy, Wide local excision with Flaps, Modified Wheeler's procedure, Z-plasty were the surgeries performed with good outcome irrespective of age and sex. Eyelid defect has a negative impact on many aspects of patients' lives. They report difficulty with self-image, securing employment and interpersonal relationships. Cosmetic correction of eyelid deformities provide improvement in psychosocial functioning. Eyelid injuries can be prevented by protective eye gears, helmet with visor and other appropriate preventive measures to address each risk factor and their prevention in the future. Eyelid defects should be carefully appraised and surgery should be planned accordingly.

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