ORIGINAL ARTICLE

UPPER EYELID RECONSTRUCTION SURGERIES; COMPARISON OF OUTCOMES BETWEEN REVERSE TENZEL FLAP VERSUS CUTLER BEARD FLAP PROCEDURE

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Background: Objective of this study was to compare Reverse Tenzel flap and Cutler Beard flap for upper eyelid defects. **Methods:** This interventional study was carried out at occuloplasty department of LRBT (Layton Rahamatullah Benevoloent Trust), Karachi. Patients diagnosed with upper eye lid defect between 50 and 75 years were included after ethical approval from institutional ethical review committee and briefing patients about study dynamics. The patients were randomly divided in two groups, group A in whom reverse tanzel flap was done, while in group B Cutler beard procedure was done. Main outcome measure was eyelid contour, complete lid closure and surgical procedure time. SPSS version 25.0 was used for data analysis. **Results:** Reverse Tenzel flap mean age 64.00±6.17 years, mean duration of surgery 33±5.78 minutes, and mean healing time 2.2±0.41 weeks. Cutler Beard flap mean age 59.60±6.26 years, mean duration of surgery 32±5.78 minutes, and mean healing time 5.7±0.8 in 3 weeks. 60% of patients were female. 30 (50%) patients each underwent Reverse Tenzel flap and Cutler Beard flap. In Reverse Tenzel flap, no complications were observed. In Cutler Beard flap, 06 (20%) patients reported mild entropion, 04 (13.3%) retraction of flap and 02 (6.7%) were found to have mild incomplete lid closure. **Conclusion:** Reverse Tenzel flap was superior to Cutler Beard flap as it reported no complications, being single stage surgery with early healing. Cutler-Beard flap reported mild entropion and retraction of flaps which required second surgery and delayed healing.

Keywords: Upper eyelid defects; Reverse tenzel flap; Cutler Beard flap

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INTRODUCTION

Due to complexity of the structure of eyelids, it remains a challenging task for reconstruction of the eyelids. The pivotal role of eyelids is to protect the eye from external pressures such as trauma, entering of light excessively and to maintain tear film integrity by movement of tears towards lacrimal drainage systems.[1] The eye muscles and eyelids provide the beauty and expression to the eyes. Provided by nature, both upper and lower eyelids have their own specific function. Therefore, it is necessary to have accurate background knowledge of basic eyelid anatomy for undertaking eyelid reconstructive surgeries.[2]

Normally the eye takes up an elliptical shape with greater curvature of upper eyelid because of tarsus shape and for eyelid's adaptation towards the globe's curvature. Just medial to pupil, within the primary gaze lies the highest point of upper eyelid's curvature. In children, the margin of upper eyelid is present at cornea's upper limbus while among adults; it lays 1–1.5 mm below the limbus.[3]

Inferiorly, the eyelid borders with corneo-scleral junction. Horizontal palpebral fissure, i.e., width of eye is about 28–30 mm. While 10–11 mm distance between margins of the eyelid is covered by vertical palpebral fissure. Above medial canthus lies the lateral canthus which is around 2 mm in diameter. Upper eyelids functions for protection of cornea. In the process of excursion, the eyelid spreads tears over in order to lubricate the cornea. The upper eyelid ought to be light in weight for facilitating mobility.[4]

Reconstruction of the upper eyelids remains to be of higher complexity as compared to the lower eyelids. The upper eyelids functions not only for protecting the globe but also as an aperture to vision. In the process of protecting and as an aperture, the upper eyelid tends to moisturize cornea through dispersal of tears over the cornea. It is important to maintain adequacy of upper eyelid in terms of mobility and height during its reconstruction. The majority of skin of upper eyelid is invisible due to folding, therefore the skin of anterior lamella must be thin and have adequate adherence to orbicularis.[5]

For reconstructing full thickness defects of eyelids, a commonly used procedure involves a semi-circular local advancement flap known as the reverse Tenzel flap. This process allows recruitment of tissue laterally to lateral canthus for allowing mobilization

of eyelid medially as well as for wound closure directly.[6] Reverse Tenzel flap success rate in lower and lateral eyelid defects ranges from 25–60%, however with upper eye lid defects, the rates are substantially higher, that is why it is performed mostly in upper eyelid surgeries.[7] Since sometimes classical flaps do not completely cover some of the peri-orbital defects, especially for larger reconstructive defects which are mostly seen after excising a malignant skin lesion in peri-orbital area.[8]

Another method used for moderate to large horizontal upper eyelid defects but having short vertical heights is known as the Cutler-Beard mode of upper eyelid reconstruction. However, the classical mode of reconstruction is now modified due to complications of tarsal support been lacking in the original or classical method of reconstruction. Due to the short height of tarsus present in lower eyelid, making tarso-conjunctival flap from lower eyelid carries little or no tarsal support.[9]

Throughout entire thickness of eyelid, extending below the vertical margins, a 4 mm incision below lid margin is made in the eyelid horizontally. Conjunctiva and around 1 mm of tarsus, is raised when available from inferior fornix. Using 6'0 vicryl, knots on raw surface are tied by advancing and suturing of the upper eyelid defect.[10]Then the incisions given vertically on skin are extended, giving rise to rectangular flap. Among old aged patients, skin flap can be easily be made because of skin laxity. One shortcoming of this method of reconstruction is lagging of time in separating the eyelids. Because of this, it no longer remains a useful procedure for monocular patients. Other complications include lack of lashes and entropion. However, it can remain an excellent procedure for reconstructing eyelid defects after excision of cancer.[11]

Patients undergoing either type of reconstruction flaps undergo surgery in general anaesthesia. Area of planned excision is marked in a rounded manner. Excised tumours are excised with adequacy of oncological safety margins as full-thickness specimen, with immediate evaluation by frozen-section examination. Reconstruction is then done after ensuring margins are confirmed to be tumor-free.[12] It is vital for ensuring to fix advancing flap on periosteum of orbital rim with permanent suture for counter-acting gravitation and preventing inferior descent of flap with late entropion.[13]

The rationale of this study was to compare Reverse tenzel flap and Cutler Beard flap procedure for upper eyelid defects in terms of outcomes and complications.

MATERIAL AND METHODS

This interventional study was carried out using consecutive sampling technique on patients attending occuloplasty department of LRBT (Layton Rahamatullah Benevolent Trust) and diagnosed as a case of upper eye lid defect due to any cause such as basal cell carcinoma, squamous cell carcinoma, sebaceous gland carcinoma and any other reason for upper eye lid defect were included in the study provided they were in between 50 and 75 years old. The study was carried out after ethical approval from the ethical review committee of the respective hospital. Duration of the study was six months. Patients that were to undergo surgery for reconstruction of upper eye lid defect were divided into two groups, one group in which the procedure of choice was reverse tenzel flap and in the other group, the choice of procedure was cutler-beard's flap.

Patients, after attaining their informed consent and briefing them about study dynamics were selected. They were looked for the clinical diagnosis which was the indication for surgery. In addition, the minutes of surgery and follow up time period were also recorded. Post-operative complications and healing time period were checked upon every follow up. All information was kept confidential. The patients were randomly divided in two groups, group A in whom reverse tanzel flap was done, while in group B Cutler beard procedure was done. Main outcome measure was eyelid contour, complete lid closure and surgical procedure time.

For data analysis, SPSS version 25.0 was used. For qualitative data, frequency in percentages was reported. Recovery time period, presence of or absence of healing and complications in-between the two groups of patients, one undergoing reverse tenzel flap and other undergoing cutler-beard flap was tested for significance by applying chi-square test, keeping p-value of <0.05 as significant.

After all aseptic measures, upper eye lid defect reconstruction was laid out using a semi-circular flap at the lateral canthus. Flap of appropriate size was arched downwards and cantholysis and canthotomy was performed to facilitate mobilization of flap nasally. Wound margins were closed directly. Suturing of flap to orbital septum was performed. The lateral canthus was fixated to conjunctiva in end.

In this technique, horizontal incision was made around 4 mm below lower eyelid at lid margin via entire thickness of lid and extended vertically below. From the inferior fornix, conjunctiva and tarsus were raised to about 1 mm. It was advanced and sutured to upper eyelid using 6'0 vicryland knots were made on raw surface. Vertical incisions on skin were extended and rectangular flap was made. Among older patients, skin flap was easily formed because of laxity of skin.

RESULTS

Mean duration of surgery in Reverse tenzel flap group was 35±5.78 mins while in Cutler Beard flap group was 45±5.78 mins (p-0.26). Mean duration of follow up in

Reverse tenzel flap group was 3.6±2 weeks while in Cutler Beard flap group was 7.5±1.66 weeks (*p*-<0.001). Mean healing time in Reverse tenzel flap group was 3.3±0.41 weeks while in Cutler Beard flap group was 6.5±0.83 weeks (*p*-<0.001).

The overall mean age of patients was 61.80±6.60 years, with overall mean duration of surgery 32.50±5.21 minutes. Mean duration of follow up was 4.20±2.07 weeks and mean time period for healing was 3.4±1.38 weeks [Table-1].

60% of patients were female while 40% male in each of the group. Eighteen (30%) patients were found to be hypertensive and diabetic each. 30 (50%) patients underwent Reverse tenzel flap surgery and 30 (50%) underwent Cutler Beard Flap surgery. The most common indication for surgery was basal cell carcinoma in 36 (60%) of patients, after which squamous cell carcinoma and sebaceous gland carcinoma in 12 (20%) patients each. All patients reported to have successfully attained healing.in reverse tenzel flap group while 06 (20%) of patients were observed to have mild entropion, 04 (13.3%) retraction of flap and02 (6.7%) had mild incomplete lid closure [Table-2].

With regards to descriptive statistics of patients according to surgical procedures, i.e., Reverse tenzel flap and Cutler Beard Flap, 18 (60%) of patients in Reverse tenzel flap group were female as well as in Cutler Beard group (*p*-1). Twelve (40%) patients each were observed to be hypertensive and diabetic in Reverse tenzel flap group and 06 (20%) patients each in Cutler Beard Flap group (*p*-0.09). Six (40%) patients each having basal cell carcinoma underwent Reverse tenzel flap surgery while 06 (20%) in Reverse tenzel flap group were operated due to sebaceous gland carcinoma. In Cutler Beard flap group, 24 (80%) patients were operated because of basal cell carcinoma while 06 (20%) due to sebaceous gland carcinoma (*p*-<0.001. In Reverse tenzel flap group, no complications were reported while in Cutler Beard flap group, 06 (20%) patients were observed to have retraction of flap, 4 (13.3%) mild entropion and 2 (6.7%) with mild incomplete lid closure (*p*-0.002) [Table-3].

Table-1: Baseline quantitative demographics of patients in the study

Variables	Mean±SD
Age (years)	61.80±6.60
Time of Surgery (minutes)	32.50±5.21
Duration of follow up (weeks)	5.20±2.07
Healing time (weeks)	5.1±1.58

Table-2: Baseline qualitative demographics of patients in the study

Variable		Frequency (%) n=60
Gender	Males	24 (40)
	Females	36 (60)
Hypertension		18 (30)
Diabetes		18 (30)
Procedure	Reverse tenzel flap	30 (50)
	Cutler Beard Flap	30 (50)
Indication for surgery	Basal Cell Carcinoma	36 (60)
	Squamous Cell Carcinoma	12 (20)
	Sebaceous Gland Carcinoma	12 (20)
Healing		60 (100)
Complications	None	48 (80)
	Mild Entropion	06 (10)
	Retraction of Flap	04 (6.7)
	Mild Incomplete Lid Closure	02 (3.3)

Table-: Descriptive statistics of patients according to surgical procedure

Variables		Reverse Tenzel Flap n=30	Cutler Beard Flap n=30	*p*-value
Age		64.00 ± 6.17	59.60 ± 6.26	<0.001
Gender	Male	12 (40)	12 (40)	
	Female	18 (60)	18 (60)	1
Hypertension		12 (40)	06 (20)	0.09
Diabetes		12 (40)	06 (20)	0.09
Indication for surgery	Basal Cell Carcinoma	12 (40)	24 (80)	
	Squamous Cell Carcinoma	12 (40)	0	
	Sebaceous Gland Carcinoma	06 (20)	06 (20)	<0.001
Mean surgery time		35 ± 5.78	45 ± 5.78	0.26
Mean follow up duration		3.6 ± 2	7.5 ± 1.66	<0.001
Mean healing time		3.3 ± 0.41	6.5 ± 0.83	<0.001
Complications	None	30 (100)	18 (60)	
	Mild Entropion	0	06 (20)	
	Retraction of Flap	0	04 (13.3)	
	Mild Incomplete Lid Closure	0	02 (6.7)	0.002

DISCUSSION

The eyelids have vital functions like protection of eyeball from external environment, provides continuity for tear film and lacrimation. It is composed of skin, mucosa, muscle tissue and secretory glands. Any lesion of eyelid differs from other body parts from the fact that the histology of eye lid is different from other parts of the body, where surgically treated procedures need perfect precision.[14] Surgical removal is primary treatment option for tumours. Excision of lesion requires safety margin of 2–5 mm with absolute tumour tissue depth. One of the most important functions of upper eyelid is protection from foreign objects as well as providing continuity of tear film over cornea. Any defect or improper reconstruction of eyelid defects leads to damaging consequences like keratitis, conjunctivitis and aesthetic deformities.[15] Rate of complications in full thickness defect for upper eyelids are more common than lower eyelids. Most important objective of surgery is complete excision of lesion in treating eyelid tumours whilst maintain anatomy and physiology of eyelid as well as its cosmetic appearance. Reconstruction of eyelid must be mobile enough for protecting eyeball from surroundings.[16]

Around 5–10% of all skin carcinomas present in periorbital area. The most common eyelid tumour is basal cell carcinoma in around 90% of cases, be it skin or upper eyelid tumour. Following it is squamous cell carcinoma, observed in around 5–10% of eyelid tumours and followed up by sebaceous gland carcinoma and melanoma.[17]Similarly in our study as well, the most commonly observed was basal cell carcinoma, followed by squamous cell carcinoma and sebaceous gland tumour. Multiple surgical procedures are used today for reconstructing of eyelid defects, occurring after especially wide excisions of periorbital lesions. The choice of procedure depends upon defect's size, full thickness skin graft or local flaps.[18]When closure is impossible directly, full thickness skin grafts were at initial stage regarded to be effective in periorbital reconstruction due to simplicity of the procedure. Nonetheless, it has some limitations for large defects, especially in poor colour of skin or inadequate thickness match. Therefore, such limitations led to finding of alternate options.[19]

Reverse tenzel flap, first described in 1975, is laterally based flap which is elevated and rotated for providing enough mobilization for repairing periorbital defect. 40% of upper eye lid defects are closed using Reverse tenzel flap. It is used for covering moderate-sized defects in single step which is efficient as well as simple and most importantly, with least donor site morbidity.[20] However, Reverse tenzel flap procedure does carry some disadvantages in terms of complications. Most commonly observed complication is cicatricial entropion.[21]Likewise, in our study none of the patients were found to have any complications. Similarly, a study on 7 patients undergoing Reverse tenzel flap procedure having 03 male and 04 females, mild entropion was observed in 1 patient (14%).[22]

The Cutler-Beard bridge flap technique is an established method for reconstruction of large full thickness upper eyelid defects. The Cutler-Beard bridge flap technique was surgically feasible in all patients without causing damage to the lower eyelid bridge or resulting in any infections. In a study, out of the 13 reconstructions without additional stabilizing tissue 3 (23%) developed an upper eyelid retraction of flap that was successfully managed using a secondary implant. None of the five reconstructions using additional scleral or tarsal tissue showed an entropion of the upper eyelid.[23] Likewise in our study as well, 6 (20%) of patients undergoing Cutler Beard flap procedure were reported to have retraction of flap and mild entropion each. To minimize this complication, it is said that in Cutler-Beard bridge flap technique, it can be combined with grafting additional stabilization tissue in defects exceeding 75% of the upper eyelid length, is a reliable method for reconstruction of large full thickness upper eyelid defects following tumour excision.

Limitations of the study

Even though our study compared the surgical outcomes after patients undergoing Reverse tenzel flap or Cutler-Beard flap procedures among upper eyelid defects, the study was not immune from selection and observer bias and the fact that the study was conducted at a single center with limited sample size, further multi-centered studies with greater sample size would be enlightening in confirming the results of this study.

CONCLUSION

According to the results of the study, Reverse tenzel flap was found to be superior to Cutler Beard flap procedure from the fact that it showed no post-operative complications with any scar formation and most importantly, it was a single stage surgery, relatively easy to perform and early healing. On the other hand, Cutler-Beard flap procedure reported mild entropion and retraction of flaps in quarter of patients, which required a second surgery and therefore delayed healing.

AUTHORS' CONTRIBUTION

SA, ZK: Conceived the idea study design. SA, ZK, SMF: Literature search, proforma design, write-

up.ZK, SA: Surgeries, data collection, patient assesment, follow-up. SA, ZK, SMS: Data analysis, review, correction. MTHK: Statistical analysis

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