



## Functional and Aesthetic Outcomes of Fricke flap in Periorbital Reconstruction – A Retrospective Study

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### ABSTRACT

The reconstruction of the periorbital tissue defects is often challenging due to its complex anatomy. A wide variety of reconstruction options were implemented based upon aesthetic unit, type of defect and skill of surgeon. Fricke flap is a laterally based monopodiced flap used to reconstruct eyelid and periorbital defects. The study evaluates the aesthetic and functional outcome of Fricke flap in patients who underwent periorbital reconstruction at Saveetha Medical College & Hospital. The post-operative record of 20 patients with lateral periorbital defect treated with Fricke flap were analyzed to grade the outcome. 70% of the patients had history of immediate trauma. The primary management after debridement with Fricke flap yields better esthetic (70%) and functional outcome (90%). Case illustration of two patients have been provided who underwent immediate periorbital reconstruction post soft tissue injury due to RTA. The study was conclusive of Fricke flap as a valuable and simple model in periorbital reconstruction.



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### INTRODUCTION

The periorbital region, a junction of the upper and mid-face, constitutes less than 1% of the total body's surface with complex anatomy. Trauma, congenital and acquired malformations, burns and tumours create soft tissue defects which often require anatomical, functional and aesthetic reconstruction of this facial subunit. Regardless of the

aetiology, reconstruction begins with an evaluation of the defect depending on the type, location, depth of the defect and the layers involved along with ophthalmic examination (Newman and Spinelli, 2007).

The periorbital zones, as described by Spinelli and Jelks, are divided into five, upper eyelid zone, lower eyelid zone, medial canthus zone, lateral canthus zone and surrounding tissue and formed reconstruction algorithm (Spinelli and Jelks, 1993). A spectrum of reconstruction methods has been advocated by Mustarde and Hughes, such as transposition flap, Tripiet flap, Fricke flap, cutaneous rim graft, the hard palate graft myocutaneous advancement flap, the cheek flap supported by fascia lata, the island tarsoconjunctival mucochondrocutaneous flap, etc. (Hughes, 1976; Herman and Bennett, 2005).

This study aims to evaluate the aesthetic and functional outcome of Fricke flap in periorbital reconstruction, thereby presenting our clinical experience and treatment outcome.

## MATERIALS AND METHODS

Patients who underwent periorbital reconstruction using Fricke flap from January 2018 to January 2020 at the Department of Plastic and Reconstructive Surgery, Saveetha Medical College, were reviewed retrospectively. Twenty patients who met the inclusion criteria were identified. Inclusion criteria include patients between 20 to 70 years of age of any gender, with lateral periorbital defect treated exclusively with Fricke flap. Patients with concomitant facial fractures, or who underwent facio-maxillary or aesthetic surgeries were excluded. The post-operative records and photographs of the patients for a follow-up period of 3 months were analyzed to grade the functional and aesthetic outcomes of the surgery. The demographic details, aetiology, site and size of the defect along with aesthetic subunit involved, were documented. Any functional disturbances or complications reported during this follow up period were also documented.

The functional outcomes were graded as 1) Excellent, with no ocular discomfort, 2) Good, with minimal functional disturbance and not requiring therapy, 3) Fair, conclusive of functional disturbance requiring nonsurgical treatment, and 4) Poor, requiring surgical intervention. The aesthetic outcomes were graded postoperatively by an independent observer by viewing the photographs of the patients. Eyebrow asymmetry and appearance of the reconstructed eyelid were the criteria being analyzed for an aesthetic outcome, which was graded as Excellent, Good, Fair and Poor. Ethical clearance for the study was obtained from the Institution Review Board. Written consent was obtained from the patients to use their data for the research and to use their photograph if necessary.

## RESULTS

We identified 20 patients who underwent periorbital reconstruction with Fricke flap. The population under consideration consisted of 14 males and 6 females with a male to female ratio of 7:3. The age ranges from 20 to 67, with a mean of  $38.7 \pm 15.21$ . The characteristics of the study and the distribution of the functional and aesthetic outcome of the study population are provided in Table 1 and Table 2.

### Case illustration

#### Case 1

21year old gentleman presented to the Department of Plastic and Reconstructive Surgery for the management of soft tissue injury in the left lateral canthal region and infraorbital region following

Road Traffic Accident (RTA). On evaluation, approximately 2 x 2 cm tissue defect extending laterally to left lateral canthal region without involving the lateral canthal tendon extending to the infraorbital area and not affecting the tarsal plate was noticed. Thorough debridement was done, and wound edges were revised. Periorbital region was reconstructed with Fricke flap.

Temporally based monopodiced flap was designed with dimensions according to the size of the defect, and the inferior border of the flap was positioned along the superior aspect of the eyebrow. Supraorbital foramen was marked so that the distal aspect of flap lies lateral to the foramen. Length of the flap corresponds to the medial border of the defect to the pivot point of the flap. The planned flap area was marked and anaesthetized with 2% lignocaine with 1:200000 adrenaline. A skin incision was made with 15 number Bard-Parker blade. The skin and subcutaneous tissue were dissected from the muscle bed of frontalis and orbicularis oculi with the utmost care given to avoid injury to the temporal branch of the facial nerve. Meticulous hemostasis was achieved. The flap was thinned, rotated and inset into the defect with 4-0 vicryl and 5-0 ethilon. The donor site was undermined, and closure was done with 4-0 vicryl and 5-0 ethilon in an interrupted fashion. A pressure dressing was provided. The patient was instructed to perform brow massage in a downward direction for at least four times daily for 5 minutes. A 3 month post-operative follow up was done (Figure 1, Figure 2 & Figure 3).



**Figure 1: Preoperative image demonstrating soft tissue injury in the left periorbital region of Case 1**

**Table 1: Characteristics of the Study Population**

Characteristics	Classification	Percentage
Gender	Male	70% (14/20)
	Female	30% (6/20)
Defect Site	Lower Lid	80% (16/20)
	Upper Lid	20% (4/20)
Aetiology of Defect	Trauma (immediate)	70% (14/20)
	Scar	30% (6/20)
Aesthetic Subunit Involved	Zone I	20% (4/20)
	Zone II	80% (16/20)
	Zone III	-
	Zone IV & V	-
Defect Size	<50%	0% (0/20)
	50-75%	80% (16/20)
	>75%	20% (4/20)
Post-op Complications	Ectropion	0% (0/20)
	Necrosis of Flap	0% (0/20)
	Brow Lift	20% (4/20)
	Lagophthalmos	0% (0/20)
	Lid Retraction	10% (2/20)

**Table 2: Distribution of Outcome after the Procedure**

Outcome		Excellent	Good	Fair	Poor
Functional	Out-come	3/20 (15%)	15/20 (75%)	2/20 (10%)	0/20 (0%)
Aesthetic	Out-come	4/20 (20%)	10/20 (50%)	4/20(20%)	2/20 (10%)



**Figure 2: Immediate post-operative image of Fricke flap in periorbital reconstruction of Case 1**



**Figure 3: Late post-operative image of Case 1**

## Case 2

20 year old, the lady presented to the Department of Plastic and Reconstructive Surgery, was diagnosed with post-traumatic ectropion right lower lateral lid. Scar revision is done, and the defect of 2.5x1.5 cm was created. Fricke flap was planned in reverse from right supraorbital region flap harvested and inset done with 5-0 ethilon secondary defect closed primarily with 3-0 vicryl and 5-0 ethilon (Figure 4, Figure 5 & Figure 6). During the follow-up, the brow lift was noted on the right side (Figure 6).



**Figure 4: Preoperative image demonstrating post traumatic ectropion right lower eyelid of Case 2**



**Figure 5: Immediate post-operative image of Fricke flap in periorbital reconstruction of Case 2**



**Figure 6: Late post-operative image of Case 2**

## DISCUSSION

The lateral temporal inferiorly based forehead flap or Fricke flap was introduced in 1829 by Johann Karl Fricke. It was mainly used for defects that affect the entire length of the lower lid or upper lid, lateral canthal defect or to introduce vascularised tissue to anterior orbital defects (Fricke, 1829). The degree of rotation around the pivotal axis of the flap is less than 90 degree, contributing to less risk of compromised blood supply. The significant disadvantages include an elevation of the level of eyebrow and an increase in the thickness of forehead skin. The raised level of the eyebrow can be managed by downward massage of the brow postoperatively or by excising skin from the opposite side (Wilcsek et al., 2005; Subramanian, 2011).

Even though Mustarde flap and Tenzel flap were used for zone I, II and III defects, utilizing lateral periorbital skin when this skin is involved in the

defect, Fricke flap or its modification can be better employed (Mustardé, 1991). Gomez et al. modified Fricke flap with an inferior extension of the flap into the inner cheek. In contrast, Griffin et al. recruited the remaining upper eyelid skin for lower eyelid reconstruction and temporal skin for upper eyelid reconstruction sparing the cheek skin (Barba-Gómez et al., 2011; Griffin and McIntyre, 2019). The effectiveness of Fricke flap with adjuvant use of Rapid Intraoperative Tissue Expansion (RITE) technique in harvesting for the periorbital flap is yet another example to demonstrate the indispensable role in periorbital reconstruction (Wilcsek et al.,

2005).

In the study, 70% of the patients had a history of immediate trauma, and primary management after debridement with Fricke flap yields better esthetic (70%) and functional outcome (90%). The majority of cases (80%), has defect size between 50-75% of lid length. 80 % was the defect involved in the lower lid (Aesthetic zone II). The brow lift was the aesthetic complication noted in the study (4/20). The preoperative plan for periorbital reconstruction should focus on the orientation of camouflagable incisions, resultant tension vectors, size shape and location of the electively created defect.

## CONCLUSION

Although advocated as outmoded or last resort technique by many surgeons, the study was conclusive of a valuable and straightforward model that can be utilized in the anterior lamella reconstruction in the upper eyelid, lower eyelid and lateral canthus.

## Conflict of Interest

The authors declare no conflict of interest for this study for this study.

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