

Observations On the Use of Personalized Composite Flaps in Postoperative Repair of Eyelid Tumour Excision

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Abstract: *Objective:* To analyze the application effect of personalized composite flap technology in the postoperative repair of eyelid tumour excision. *Methods:* To retrospectively analyze the clinical data of 76 patients who underwent postoperative repair of eyelid tumour excision in the outpatient clinic of the Affiliated Hospital of Hebei University during May 2022–April 2024, and group them according to the method of repair. 38 patients who underwent local flap transfer repair were included in the control group, and the other 38 patients who underwent personalized composite flap repair were included in the observation group. *Results:* Eyelid defect repair in the patients of the observation group was significantly higher than that of the control group (78.95%) in the total effective rate of defect repair (97.37%), ($P < 0.05$); before repair, the difference between the two groups of patients in terms of eyelid fissure length difference and eyelid fissure height difference was insignificant ($P > 0.05$); after repair, the difference in the length of the eyelid fissure and eyelid fissure height difference of the patients of the two groups was significantly reduced, and the observation group was lower than that of the control group ($P < 0.05$); before repair, there was no statistically significant difference between the aesthetic function scores of the two groups ($P > 0.05$); after repair, the aesthetic function scores of the patients in the observation group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$); after the operation, the total incidence of complications such as ptosis, eyelid margin incision marks and suture disintegration in the observation group was significantly lower than those in the control group (26.32%), ($P < 0.05$). *Conclusion:* The application of personalized composite flap technique for postoperative repair of eyelid tumour excision is effective, which not only helps to reduce the difference in lid height and length and improve the appearance of the patients, but also greatly reduces the risk of complications such as ptosis, lid margin incision marks and suture disintegration, and is recommended to be widely used in the clinic.

Keywords: Eyelid tumour excision; Personalized composite flap; Local flap transfer repair; Repair outcome

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1. Introduction

Eyelid tumours are one of the most common diseases in ophthalmology and plastic surgery, including benign tumours such as blepharoplastoma and sweat gland tumours, as well as malignant tumours such as basal cell carcinoma and squamous cell carcinoma^[1]. Since the eyelid plays an important role in the protection of the eyeball and the secretion and distribution of tears, the treatment of eyelid tumours not only focuses on the thoroughness of the tumour resection but also on the postoperative repair of eyelid function and appearance. Traditional local flap transfer repair has some limitations in functional recovery and aesthetic effect, especially in the face of medium to large defects, and the difficulty of repair has increased significantly^[2]. The personalized composite flap technique has shown unique advantages in recent years. This technique combines the biological properties of different types of flaps, and through precise design and individualization, it is possible to achieve a high degree of restoration of the postoperative appearance while meeting the anatomical and functional requirements. Especially after eyelid tumour excision, personalized composite flap repair can effectively cover the defective area, restore the physiological function of the eyelid, and improve the patient's facial aesthetics, thus significantly improving the patient's quality of life^[3]. Compared with conventional flap repair, the personalized composite flap has a more precise and flexible adaptation, which not only can be designed according to the extent and depth of the defect but also can be used to select the appropriate type of flap and donor area according to the patient's specific conditions, thus reducing the incidence of postoperative complications^[4]. This study aims to analyze the advantages and effects of this technique in eyelid repair and to provide more scientific evidence to optimize the postoperative treatment of eyelid tumours and improve the overall recovery of patients.

2. Information and methodology

2.1. General information

The clinical data of 76 patients who received postoperative repair treatment for eyelid tumour excision in the outpatient clinic of Hebei University Hospital in May 2023–April 2024 were retrospectively analyzed, and grouped according to the method of repair they received, and 38 patients who received local flap transfer repair were included in the control group, and the other 38 patients who received personalized composite flap repair were included in the observation group. In the control group, there were 20 males and 18 females, with an age range of 35–78 years old, and a mean age of 56.3 ± 10.4 years old. Tumour types: lid xanthoma 5 cases, sweat gland tumour 6 cases, basal cell carcinoma 17 cases, squamous cell carcinoma 10 cases; in the observation group, there were 19 males and 19 females, with an age range of 34–79 years old, and an average age of (57.1 ± 11.2) years old. Tumour types: 4 cases of blepharocarcinoma, 7 cases of sweat gland tumour, 18 cases of basal cell carcinoma and 9 cases of squamous cell carcinoma. Comparing the general data of the two groups of patients, the difference was not statistically significant ($P > 0.05$).

Inclusion criteria: (1) Patients diagnosed as basal cell carcinoma, squamous cell carcinoma or other benign tumours of the eyelid by pathological examination, all of which are unilateral eyelid tumours and need to undergo restorative treatment after tumour resection; (2) Age between 34 and 79 years old; (3) Physical health condition allows to receive eyelid tumour resection and repair surgery; (4) Patients voluntarily participated in the study, informed and agreed to postoperative follow-up and efficacy observation.

Exclusion criteria: (1) Patients with tumours spreading to both eyelids or involving other important tissues such as the eyeball; (2) Patients with serious systemic diseases (such as uncontrolled diabetes mellitus, cardiovascular disease, etc.) who cannot tolerate surgery; (3) The tumour invades the deep orbital layer or the

surrounding important tissues, and the treatment cannot be completed by conventional resection and repair; (4) Patients who are unable to cooperate with postoperative follow-up and treatment effect evaluation.

2.2. Methodology

2.2.1. Control group

The autologous labial mucosa and adjacent flap transfer repair technique was implemented. Preoperatively, the need for repair is assessed based on the extent and depth of the patient's defect after eyelid tumour excision, and the area of the lip mucosa to be taken and the adjacent skin flap transfer is designed. The lower lip mucosa is often chosen as the donor area, while the adjacent skin is planned as the flap donor area.

- (1) Tumour excision: Total resection is performed according to the extent of the tumour, ensuring that the margins are thoroughly removed, and rapid intraoperative pathological sectioning is performed to confirm that there is no tumour residue at the margins.
- (2) Lip mucosa harvesting: An appropriate amount of mucosal tissue was excised from the medial side of the lower lip without tension, paying attention to the protection of lip function and appearance, and the excised mucosa was used to repair the blepharoplasty and mucosal defects of the eyelid.
- (3) Neighbouring flap transfer: According to the design, a flap from the neighbouring area was cut to ensure that the size and shape of the flap were suitable to cover the eyelid surface defect. The flap is transferred to the defect site after preserving the blood supply, and at the same time, it is integrated with the labial mucosal tissue.
- (4) Fine suturing: The labial mucosa and the flap are fixed to the defect area, and attention is paid to the precision of the suture to ensure that the postoperative tissue tension is moderate and the natural curvature of the eyelid margin is restored.
- (5) Postoperative treatment: Cover the wound and fix it, apply antibiotics to prevent infection, and follow up regularly to observe the healing of the donor and repair areas.

2.2.2. Observation group

According to the specific scope and location of the eyelid defect and the involvement of surrounding tissues, a personalized repair plan was formulated, and the composite flap technique was used for repair. During the implementation of the repair of the inner layer of eyelid defects, the lid plate and lid conjunctival layer were incised, the lid plate was vertically separated to the position of the fornix, and the tipped lid conjunctival flap was transferred to the area of the defect and sutured to the stump of the lid plate to complete the reconstruction of the inner layer. In patients with 1/3–1/2 of the defect in the lateral canthus and posterior layer, an orbital periosteal flap at the base of the lateral orbital rim is designed according to the defect. The periosteal flap needs to be cut upward obliquely and sutured to the lid stump to fill the posterior layer defect. In severe patients with more than 1/2 of the posterior layer defects, free palpebral mucosal grafts are used to ensure structural integrity and functional recovery. For defects in the anterior layer of the eyelid, a tipped flap was used. Different repair strategies were used for different parts of the eye, such as the upper eyelid flap for lower lid defects, the frontal lozenge flap for medial canthus defects, and the lateral temporal pedicled transposition flap for lateral canthus defects. Postoperatively, a pressure bandage was applied to the operated eye for 1–2 days, and the dressing was changed once a day until the stitches were removed 7–10 days after surgery. After discharge from the hospital, the patient was instructed to have a regular review and follow-up for any discomfort.

2.3. Observation indicators

- (1) Effectiveness of eyelid defect repair: Based on the recovery of eyelid structure and function after surgery, the effectiveness of repair is classified as cured, improved and ineffective, according to the following criteria:
 - (a) Cure: The defective area is completely repaired, and the eyelid shape is in harmony with the surrounding tissues, with a good natural appearance and no obvious scar. The function of the eyelid is normalized, with smooth opening and closing of the eyes and good eyeball protection.
 - (b) Improvement: The defective area is basically repaired, and the appearance of the eyelid is slightly abnormal, but basically matches with the surrounding tissues. Eyelid function is partially restored, eye opening and closing activities are mildly limited, tear distribution is slightly affected, and there are minor postoperative complications, but they do not affect daily life.
 - (c) Ineffective: Failure to repair the defective area, obvious abnormal appearance of the eyelid, morphological imbalance or severe scarring. Eyelid function is not restored or significantly impaired, with complications such as difficulty in opening and closing the eyes, impaired tear distribution, or even exposure to keratitis. Necrosis of the flap or grafted tissue, or need for re-surgical repair due to infection, etc. Overall effective rate = cure rate + improvement rate.
- (2) Improvement of lid fissure condition: Changes in the difference in lid fissure height and length before and after repair were recorded.
- (3) Evaluation of aesthetic repair results: Combined with the functional and morphological changes of the eyelids, the aesthetic effect of the repair was evaluated, and the total score was 2 points. If the eyelids are bilaterally symmetrical, there is no obvious difference in the length and height of the lid, and there is no inward turning, 2 points will be recorded; if the morphology and function have improved, but the depth of the marginal cut mark is ≥ 1 mm, 1 point will be recorded; if there is no improvement in the morphology and function, 0 points will be recorded. The higher the score, the more ideal the restoration effect.
- (4) Incidence of complications: Record the occurrence of postoperative complications such as ptosis, eyelid margin scars and suture disintegration in patients. Total incidence rate = Number of relevant complications / Total number of cases \times 100 percent.

2.4. Statistical methods

SPSS 20.0 statistical software was applied to analyze and process the relevant data. Measurement data were expressed as mean \pm standard deviation (SD) and compared with *t*-test; count data were expressed as (*n*/%) and compared with χ^2 test. The difference was statistically significant with $P < 0.05$.

3. Results

3.1. Comparison of the effect of eyelid defect repair between the two groups of patients

Eyelid defect repair in patients of the observation group was significantly higher than that of the control group in terms of the total effective rate of defect repair, and the difference was statistically significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of the results of eyelid defect repair between the two groups (n, %)

Groups	Curable	Take a turn for the better	Null	Overall effectiveness rate
Control group (n = 38)	12 (31.58)	18 (47.37)	8 (21.05)	30 (78.95)
Observation group (n = 38)	18 (47.37)	19 (50.00)	1 (2.63)	37 (97.37)
χ^2				4.5373
<i>P</i>				0.0332

3.2. Comparison of improvement in lid condition between the two groups of patients

Before repair, the difference between the two groups of patients in terms of lid length difference and lid height difference was not significant ($P > 0.05$); after repair, the difference between the two groups of patients in terms of lid length difference and lid height difference was significantly reduced, and the observation group was lower than the control group, with a statistically significant difference ($P < 0.05$) (Table 2).

Table 2. Comparison of the difference in lid length and lid height between the two groups of patients before and after repair (mean \pm SD, mm)

Groups	Difference in lid length				Difference in lid height			
	Pre-restoration	After repair	<i>t</i>	<i>p</i>	Pre-restoration	After repair	<i>t</i>	<i>p</i>
Control group (n = 38)	2.32 \pm 0.42	1.76 \pm 0.32	6.5378	0.0000	2.51 \pm 0.69	1.67 \pm 0.49	6.1186	0.0000
Observation group (n = 38)	2.34 \pm 0.45	1.46 \pm 0.28	10.2353	0.0000	2.53 \pm 0.57	1.44 \pm 0.42	9.4901	0.0000
<i>t</i>	0.2003	4.3492			0.1378	2.1969		
<i>P</i>	0.8418	0.0000			0.8908	0.0312		

3.3. Comparison of aesthetic function between the two groups of patients before and after restoration

Before repair, there was no statistically significant difference between the aesthetic function scores of the two groups ($P > 0.05$); after repair, the aesthetic function scores of the patients in the observation group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$) (Table 3).

Table 3. Comparison of aesthetic function scores between the two groups of patients before and after repair (mean \pm SD, points)

Groups	Pre-restoration	After repair	<i>t</i>	<i>p</i>
Control group (n = 38)	0.93 \pm 0.24	1.52 \pm 0.20	11.6418	0.0000
Observation group (n = 38)	0.91 \pm 0.26	1.85 \pm 0.12	18.3240	0.0000
<i>t</i>	0.3484	7.5603		
<i>P</i>	0.7285	0.0000		

3.4. Comparison of the occurrence of postoperative-related complications between the two groups

Postoperatively, the total incidence of complications such as ptosis, lid margin cut marks and suture disintegration

was significantly lower in the observation group than in the control group, and the difference was statistically significant ($P < 0.05$) (Table 4).

Table 4. Comparison of the occurrence of postoperative-related complications between the two groups (n, %)

Groups	Drooping upper eyelid	Eyelid margin incision	Stitching is falling apart	Total incidence
Control group (n = 38)	3 (7.89)	5 (13.16)	2 (5.26)	10 (26.32)
Observation group (n = 38)	0	1 (2.63)	0	1 (2.63)
χ^2				8.6098
P				0.0033

4. Discussion

The eyelid plays an irreplaceable role in protecting the eyeball and maintaining the normal visual function, therefore, repair after eyelid tumour excision is not only necessary for restoring the appearance but also concerns the reconstruction of eyelid function. Scientific and effective repair techniques can maximize the restoration of the anatomical structure and dynamic function of the eyelid, ensure smooth opening and closing movements, avoid corneal exposure and secondary infections, and at the same time improve the patient's appearance, quality of life, and psychological state, which is of great significance for the patient's overall recovery [5]. However, traditional local repair techniques, such as autologous labial mucosa combined with neighbouring flap transfer, although able to fill the eyelid defect to a certain extent and restore partial function, still have many shortcomings [6]. Firstly, the texture of the labial mucosa is significantly different from that of the eyelid tissue, which may lead to poor eyelid dynamics after surgery, affecting the opening and closing of the eyes. Secondly, the strong dependence of neighbouring flap transfer on the donor tissue may lead to increased tension, significant scarring, and impaired function of the donor area. In addition, this repair method makes it difficult to achieve precise reconstruction of anatomical levels in the face of medium- to large-scale defects, which may lead to unnatural postoperative appearance and asymmetric morphology; for this reason, it is necessary to actively explore a more precise and efficient repair method.

The personalized composite flap technique is a combination of multiple flaps and grafts, individually designed for the patient's specific defects, to achieve a multilevel reconstruction of the eyelid structure [7]. The core mechanism of the technique is the combination of lid conjunctival flaps, periosteal flaps, free palpebral mucosal, and tipped flaps through fine anatomical dissection and tissue transposition, which allows for the precise repair of the inner and outer eyelid structures while restoring the dynamic function of the eyelid [7].

The results of this study showed that the results of eyelid defect repair, improvement of lid fissure, aesthetic and functional scores, and the incidence of related complications were significantly better than those of the control group, and the reasons for this were mainly due to the significant advantages of the personalized composite flap repair technique. Firstly, the design of the composite flap can accurately match the size and scope of the patient's defect to achieve personalized repair. Second, the anatomical integrity and physiological function of the eyelid can be restored to the maximum extent through the combined application of multiple tissue materials [9]. Thirdly, the technique is particularly effective in cosmetic repair, improving eyelid symmetry and reducing scar formation. Fourth, due to the adequate blood supply and strong tissue integration, composite flap repair can significantly reduce the incidence of postoperative complications and improve the long-term stability and aesthetic effect of the

postoperative repair^[10].

5. Conclusion

In conclusion, the application of a personalized composite flap repair technique in the postoperative repair of eyelid tumour excision has a positive clinical value in terms of repair effect, aesthetic effect, and reduction of the risk of complications.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Zhang H, Zhao X, Wang X, et al., 2024, Efficacy and Safety of Penetrating Flap Eyelid Reconstruction for Eyelid Repair and Reconstruction in Postoperative Patients with Eyelid Tumours. *New Progress in Ophthalmology*, 44(2): 123–126.
- [2] Yu M, Ma F, 2022, The Efficacy of Composite Flap for Repairing Full Eyelid Defects After Malignant Tumour Surgery. *Journal of Clinical Ophthalmology*, 30(2): 152–155.
- [3] Li Z, 2021, Observation on the Application Effect of Skin Orbicularis Oculi Composite Tissue Flap Repair in Plastic Repair of Eyelid Avulsion Injury. *Practical Chinese and Western Medicine Clinic*, 21(16): 139–140.
- [4] Yang J, Song L, Wang J, et al., 2024, Screening and Analysis of Differential Genes in Basal Cell Carcinoma of the Eyelid. *New Progress in Ophthalmology*, 44(6): 454–457.
- [5] Yunoki T, Hayashi A, Oiwake T, et al., 2022, Efficacy and Safety of Cryotherapy for Residual Tarsus and Free Tarsal Graft Implantation After Excision of Malignant Eyelid Tumour. *Journal of Craniofacial Surgery*, 33(6): e598–e601.
- [6] Bai R, Zhao Y, Hao H, et al., 2020, Clinical Effect of Local Flap Combined with Allogeneic Scleral Graft in Repairing Eyelid Defects After Eyelid Malignant Tumour Excision. *Practical Chinese and Western Medicine Clinics*, 20(9): 99–100 + 113.
- [7] Gong Q, Shao Q, 2023, Observations on the Effect of Stage I Orbicularis Oculi Flap Repair After Mohs Method of Controlling Eyelid Malignant Tumour Resection. *Journal of Harbin Medical University*, 57(3): 284–288.
- [8] Hamel RK, Hall EL, Goldberg LH, et al., 2023, Reconstruction of a Defect on the Right Lower Eyelid and Infraorbital Cheek. *Dermatologic Surgery*, 49(3): 295–297.
- [9] Yang J, Sun R, Wang L, et al., 2022, Clinical Effect of Lid Conjunctival Flap in the Repair of Posterior Eyelid Layer Defects After Eyelid Tumour Surgery. *Journal of Practical Cancer*, 37(11): 1899–1901.
- [10] Yan W, Min W, Zhang W, et al., 2022, Observation on the Effect of Orbicularis Oculi Composite Flap Combined with Upper Eyelid Skin Laxity Correction for Repairing Large Area of Postoperative Defects of Lid Xanthoma. *Journal of Hebei Medical University*, 43(12): 1464–1467 + 1478.

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