



# Use of a perforator/subcutaneous pedicled propeller flap for reconstruction of lower eyelid defects

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## KEYWORDS

Lower eyelid defect;  
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**Summary** Full-thickness skin grafts (FTSGs) and flaps from the upper eyelid or cheek can be used for reconstruction of lower eyelid defects, including the anterior lamella. However, the upper eyelid has a limited and insufficient amount of skin, whereas cheek flaps have a restricted arch of rotation. Here we report the procedure and outcomes of a perforator/subcutaneous pedicled propeller flap for reconstruction of lower eyelid defects including the anterior lamella. A retrospective study of 12 patients who underwent treatment for eyelid anterior lamella defects with perforator/subcutaneous pedicled propeller flaps was conducted between March 2015 and June 2017. The propeller flap was planned to rotate around the perforator (as the pivot point), which was detected with a hand-held Doppler in the vicinity of the defect. The flaps were perforator pedicled for 10 patients and subcutaneous pedicled for the other two patients. The flap was rotated around the pedicle and placed on each patient's defect without tension. No vascular compromise occurred with any of the flaps. The most important complications were post-operative oedema and ecchymosis.

Inferior eyelid defects including the anterior lamella could be reconstructed by using propeller flaps from the adjacent tissue. The main advantages of this flap included easy access to the defect, no impairment in eyelid function and very good aesthetic results.

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## Introduction

Eyelids are important for facial appearance as well as for protecting and covering the eye. Therefore, an ideal reconstruction of an eyelid must sustain eyelid functions along with ensuring an aesthetically pleasing appearance.

Lower eyelid defects usually result from excision of neoplasms, but also may be caused by congenital anomalies, burns and trauma. Basal cell carcinoma is the most common cancer of the lower eyelid.<sup>1</sup>

Eyelids anatomically consist of anterior and posterior lamellae, which provide a better understanding for identification of eyelid defects and reconstructive options.<sup>2</sup> The anterior lamella consists of skin, which is the thinnest skin in the body, and orbicularis oculi muscle, whereas the

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**Table 1** Clinical cases.

Patient No.	Year/Sex	Diagnosis	Side	Localisation	Pedicle	Defect size cm	Follow-up (mo)
1	44/F	BCC	Left	Medial	Perforator	1.7 × 2.2	10
2	54/F	BCC	Left	Medial	Perforator	1.4 × 2.0	5
3	88/F	BCC	Right	Lateral	Subcutaneous	1.8 × 2.5	10
4	51/M	BCC	Right	Medial	Perforator	1.4 × 2.2	10
5	54/F	SK	Left	Medial	Perforator	1.2 × 2.0	7
6	69/F	BCC	Left	Lateral	Perforator	1.6 × 1.4	26
7	78/F	BCC	Right	Lateral	Perforator	1.8 × 1.2	7
8	75/F	BCC	Left	Inferior	Perforator	5.0 × 3.5	19
9	46/M	BCC	Left	Lateral	Subcutaneous	1.2 × 1.8	12
10	41/M	BCC	Right	Lateral	Perforator	2.4 × 1.7	18
11	62/M	SK	Left	Lateral	Perforator	1.0 × 2.5	15
12	52/F	BCC	Left	Lateral	Perforator	1.2 × 1.7	12

BCC, basal cell carcinoma; SK, seborrheic keratosis; F, female; M, male; L, left; R, right.

posterior lamella consists of the tarsus and underlying conjunctiva.<sup>3,4</sup>

Techniques for lower eyelid reconstruction range from healing by secondary intention to complex flaps. When a lower eyelid defect includes only the skin and the orbicularis muscle, a full-thickness skin graft or myocutaneous flap from the upper eyelid and rotation flaps from the surrounding tissues may solve this problem.<sup>5,6</sup>

In this report, we describe a perforator/subcutaneous pedicled propeller flap for reconstruction of lower eyelid defects and its results.

## Patients and methods

We conducted a retrospective study with 12 patients who underwent treatment between March 2015 and June 2017 for eyelid anterior lamella defects using a perforator/subcutaneous pedicled propeller flap. The mean age of the patients was 59.5 years (range, 41-78 years; [Table 1](#)).

## Surgical procedures

A lower eyelid tumour excision was planned to include 5 mm of healthy skin periphery in the lesion. A perforator point was detected with a hand-held Doppler and marked in the vicinity of the defect to be reconstructed. A vertically oriented flap was planned to be rotated to the defect based on this perforator ([Figures 1, 2, 6, 7, 11, 12, 15](#)). The flap was planned lateral to the defect for 11 patients and inferior to the defect for the remaining patient. Patients were anaesthetised with local infiltration of 2% lidocaine with 1:200,000 epinephrine, and the tumour tissue was excised. The planned flap was then incised circumferentially. A perforator coursing through the flap was visualised in 10 patients, and the flap was elevated based on this perforator without complete skeletonisation by leaving a small amount of connective tissue around the perforator ([Figures 3, 8](#)). The flap was rotated 90° and placed over the defect ([Figures 4, 9, 13](#)). The perforator was not encountered in two patients while the flap was elevated. These flaps were dissected at the base and at the peripheral tissue to allow

free rotation and placed on the defect by rotating based on the subcutaneous tissue at their base. All donor site defects were primarily closed. Patients were advised to apply ice for 48 h and were discharged the same day.

## Results

The most important problems encountered post-operatively were oedema and bruising. Oedema was the most notable on the first and second post-operative days and subsided substantially within 1 week. Complete resolution of ecchymosis took 2 weeks for some patients. Unlike reconstruction of lower eyelids with cheek flaps, temporary ectropion due to oedema was not encountered, because the flaps were free all around. Pathology results showed basal cell carcinoma for 10 patients and seborrheic keratosis for two patients. During the follow-up, no problems such as ectropion or lower eyelid retraction occurred. The aesthetic results were very good ([Figures 5, 10, 14, 16](#)). No relapse or complications developed after the reconstruction in 12.25 months of follow-up.



**Figure 1** A 78-year-old patient with basal cell carcinoma affecting the inferior-lateral eyelid.



**Figure 2** The perforator point was detected with a hand-held Doppler, and the flap was planned lateral to the defect.



**Figure 3** The perforator was detected, and the flap was skeletonized to ensure comfortable rotation.

## Discussion

Reconstructive options vary for lower eyelid reconstruction depending on the location, size and composition (including the anterior lamella only or together with the posterior lamella) of the defect.<sup>7,8</sup> Small lower eyelid defects (< 25% of the lid) can be allowed to heal by secondary intention.<sup>9</sup> However, even if the eyelid defect is small, secondary healing is not usually preferred because of both the patient's discomfort and the long healing period. Another option for lower eyelid defects including the anterior lamella is a full-thickness skin graft (FTSG).<sup>10,11</sup> The upper eyelid can also be considered as a graft donor site, but it is recommended only for small defects. Complications associated with FTSG include graft failure, graft contraction and ectropion formation.<sup>12</sup>

Local flaps tend to better match the skin colour, thickness and texture because adjacent tissues resemble each other more than any other tissues. Cutaneous or myocuta-



**Figure 4** The flap covered both the defect and the donor site without eyelid retraction.



**Figure 5** Very good aesthetic results were obtained.

neous flaps from the upper eyelid can be used for lower eyelid reconstruction, but the limited width of the upper eyelid flap is the most important disadvantage of this flap.<sup>2,3,13,14</sup> Cheek, temporal forehead or nasolabial tissue can be used as flap donor sites for wider lower eyelid defects, including the anterior lamella.<sup>2,3,13-16</sup>



**Figure 6** A basal cell carcinoma involving the left lower eyelid.



**Figure 7** The flap was planned lateral to the defect.

Hyakusa et al. first named the propeller flap in 1991, while this flap was being used as a subcutaneous flap.<sup>17</sup> Hallock used the propeller flap based on a skeletonised perforating vessel.<sup>18</sup> The propeller flap is commonly used, especially for lower extremities, upper extremities and the trunk. However, data on the use of this flap for lower eyelids are limited.<sup>19-21</sup>

Patients requiring reconstruction for lower eyelid tumour excision are usually elderly; therefore, the lower eyelid itself and the surrounding tissue can be used as a flap. Also, the perforator/subcutaneous pedicled design of the flap permits easy flap rotation to the defect without lower eyelid retraction. For patients with more extensive and total eyelid defects, the flap included the cheek region tissue.



**Figure 8** The flap was rotated 90° around the perforator to inset the defect.



**Figure 9** The flap was rotated 90 ° around the perforator to inset the defect.



**Figure 10** The follow-up showed very good aesthetic results.



**Figure 11** A patient with basal cell carcinoma of the lower lid.



**Figure 12** A propeller flap was planned lateral to the defect.

Even though cheek skin is thicker than eyelid skin, the aesthetic results were acceptable because of the similarities in colour.

The most important problems with lower eyelid reconstruction include ectropion and retraction of the eyelid. These complications are unavoidable with skin graft reconstructions. Such complications can even be expected in flaps with a skin paddle because of skin paddle retraction on the flap. Both the subcutaneous tissue and the submuscular tissue in the eyelid are quite lax. The flaps were moved to the defects by separating them. This provided an opportunity for extensive rotation and advancement. Consequently, the lower eyelid reconstruction was performed without tension and the donor site was closed primarily by using redundant (especially with elderly patients) lower eyelid and cheek skin.

Furthermore, in patients without a perforator, adequate subcutaneous dissection was performed, and flaps were rotated to the defects. No arterial or venous compromise oc-



**Figure 13** Immediate and approximately 1 months results.



**Figure 14** Immediate and approximately 1 months results.

curred in the two patients. This demonstrated that subcutaneous pedicled use of the flap was also safe.<sup>21</sup> Long-term cosmetic results were quite good because of the use of the lower eyelid and vicinal tissues for reconstruction of the lower eyelid.

## Conclusions

The perforator/subcutaneous pedicled propeller flap based on subcutaneous or perforator pedicle can be safely used for lower eyelid reconstruction. The advantages of this method



**Figure 15** A patient with left lower eyelid basal cell carcinoma. A propeller flap was planned and after the excision the flap was inserted by 90° rotation to the defect. The donor site was primary treated.



**Figure 16** Postoperative photograph 4 months after the tumour excision. Very good aesthetic results were obtained.

included achieving the best possible aesthetic outcome, excellent resemblance in colour and texture, a donor area in proximity to the defect and secondary procedures, inconspicuous scars and no complications such as ectropion and lower eyelid retractions.

### Conflict of interest statement

The authors have no conflict of interest or source of funding that requires disclosure.

Work has not been presented earlier in any conference.

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