

# Switch Flap for Upper Eyelid Reconstruction— How Soon Should the Flap Be Divided?

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**Background:** The results of a cohort of patients treated at one institution for upper eyelid reconstruction with the switch flap method after a defect due to excision of malignant tumor were reviewed.

**Methods:** A retrospective data file review of all patients who had undergone total upper eyelid reconstruction with the switch flap method was conducted at the Saga University Hospital between April 2000 and October 2014. The follow-up lasted for varying periods during which the preoperative and postoperative photographs were compared as well.

**Results:** A total of 10 patients with upper eyelid tumors, that is, 7 sebaceous carcinoma, 2 squamous cell carcinoma, and 1 basal cell carcinoma, underwent reconstructive surgery. With the switch flap technique, the defects resulting from tumor excision were completely covered in all cases. The mean of defect widths after tumor excision (A) was 18.8 mm (range, 15–25 mm), the mean of widths of switch flaps (B) was 13.3 mm (range, 8–22 mm), and the mean of B/A ratios was 0.69 (range, 0.5–0.88). When the switch flap was divided at 7 to 14 days, there was no flap loss, trichiasis, or corneal ulcer.

**Conclusion:** Our protocol managed to make flaps with a B/A ratio of 0.5–0.7, and the flaps were divided at 7 to 14 days after surgery, the timing of which was much earlier than in the conventional method, lessening the possibility of complications. (*Plast Reconstr Surg Glob Open* 2016;4:e695; doi: 10.1097/GOX.0000000000000670; Published online 25 April 2016.)

To repair a large defect associated with upper eyelid reconstruction after excision of malignant tumor, both anterior and posterior lamellae must be reconstructed simultaneously. Large upper lid defects of more than half the horizontal length of the lid usually require separate reconstruction of the anterior and posterior lamellae. Reconstruction of the posterior lamella, including the

upper lid conjunctiva, is required for the maintenance of visual acuity. The major function of the upper eyelid is to protect the eye from foreign objects and to provide tear film continuity over the cornea. A large defect in the upper lid after tumor excision is conventionally reconstructed by a Cutler-Beard bridge flap from the lower lid to the upper lid.<sup>1</sup> A demerit of this technique is that the Cutler-Beard flap occludes vision for 4–8 weeks and must be divided in the second stage of the surgical procedure.<sup>2,3</sup>

The switch flap, another lid-sharing flap type, was originally described by Mustardé<sup>4</sup> for the correction of upper eyelid defects. The Mustardé procedure,

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Received for publication November 9, 2015; accepted February 17, 2016.

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DOI: 10.1097/GOX.0000000000000670

**Disclosure:** The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

however, has not been practiced widely thus far, perhaps because of its technical difficulty. In this technique, a full-thickness flap on a pedicle is switched from lower lid to upper lid to fill a full-thickness eyelid defect there. The pedicle is usually divided in 3 weeks. The donor site is reconstructed by direct closure with or without cantholysis or sliding flap, or left to heal by secondary intention.<sup>5</sup> In general, the complication rate of full-thickness defects in upper lids is higher than that in lower lids.<sup>6</sup> A usual alternative to the Mustardé method is the Cutler-Beard procedure, which involves lid switch and lid bridge flaps that are prepared from an inferior eyelid for a superior eyelid reconstruction, and the procedure needs a secondary surgery for flap division.<sup>2,3,5</sup> Wide resections of the lower eyelid and long-time exposure of the cornea to the atmosphere are the most serious disadvantages of this procedure, which lead to complications such as exposure keratitis, corneal ulcer, and deformity.<sup>2</sup>

We describe our switch flap technique for total upper eyelid reconstruction as it addresses the disadvantages referred to above. The timing of flap division in our method is probably the key factor. We treated 10 patients with this technique with a minimum of complications and with good aesthetic results.

### MATERIALS AND METHODS

We conducted a retrospective data file review of all patients who underwent upper eyelid total reconstruction with the switch flap method for the defects resulting from excision of malignant tumors at the Saga University Hospital between April 2000 and October 2014. Patients were identified from a clinical database. Data collected included patient name, age, sex, diagnosis, laterality, day of surgery, and also surgical details including horizontal widths of defects after excision and horizontal widths of switch flaps

for reconstruction, time to dividing of the flap in second surgery, follow-up duration, and postoperative complications, if any.

Eleven cases of full-thickness defects resulting from excision of tumors of only upper eyelid were indicated and taken for repair using the switch flap technique. The technique involves switching a full-thickness flap on a pedicle from lower lid to upper lid to fill a defect there. The pedicle is divided at 7 to 14 days after surgery to lessen the possibility of complications such as corneal ulcer due to flap contact and drying of the cornea for more than a few weeks. The recipient lid is reconstructed by direct closure and the flap procedure using a propeller flap or McGregor Z-plasty at first surgery. The follow-up lasted over varying periods, and the preoperative and postoperative photographs were also compared.

### RESULTS

A total of 10 patients with upper eyelid tumors, that is, 7 sebaceous carcinoma, 2 squamous cell carcinoma and 1 basal cell carcinoma, were included in this study. One case (sebaceous carcinoma) was excluded due to insufficient data for horizontal width of the upper eyelid defect and time to flap dividing in second surgery (Tables 1 and 2).

Using the switch flap technique, the defects resulting from tumor excision were completely covered in all 10 cases. Switch flaps took alive completely including divided flaps. The recipient lid was reconstructed by direct closure in 7 cases, by flap procedure using a propeller flap in 2 cases, and by McGregor Z-plasty in 1 case at initial surgery. The mean of defect widths after tumor excision (A) was 18.8 mm (range, 15–25 mm), the mean of widths of switch flaps (B) was 13.3 mm (range, 8–22 mm). The mean of B/A ratios was 0.69 (range, 0.5–0.88).

There was no major complication without a bandage contact lens. The main morbidity was blurred vision un-

**Table 1. Patients’ Demographics (Left Half Side of Table)**

Case	Age (yr)	Sex	Pathology	Laterality	Size of Safety Margin (mm)	Defects Size (A) (Width:mm)	Flap Size (B) (Width:mm)	B/A Ratio
1	81	Male	Sebaceous Ca	Rt	5	18	9	0.5
2	83	Female	BCC	Rt	5	25	22	0.88
3	71	Male	Sebaceous Ca	Rt	5	20	15	0.75
4	84	Male	SCC	Lt	10	25	20	0.8
5	83	Female	Sebaceous Ca	Lt	5	13	9	0.69
6	71	Female	Sebaceous Ca	Rt	5	21	13	0.62
7	86	Female	SCC	Lt	5	16	10	0.62
8	48	Male	Sebaceous Ca	Rt	5	15	12	0.8
9	79	Male	Sebaceous Ca	Lt	4	15	8	0.53
10	78	Female	Sebaceous Ca	Lt	5	20	15	0.75
11	78	Female	Sebaceous Ca	Lt	5	?	20	?

A indicates defect width after tumor excision; B, width of switch flap. BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

**Table 2. Patients' Demographics (Right Half Side of Table)**

Case	B/A Ratio	Reconstruction Procedure (Donor Site)	Time to Dividing of Flap (d)	Revision Surgery	Other Eye	Complications	Follow-up (month)
1	0.5	Suture	11	No	Normal	No	12
2	0.88	Propeller flap	7	No	Normal	Bulky switch flap	3
3	0.75	Suture	7	No	Normal	No	36
4	0.8	Propeller flap	7	No	Blind	No	12
5	0.69	Suture	7	No	Normal	No	18
6	0.62	McGregor Z	11	No	Normal	No	24
7	0.62	Suture	7	No	Normal	No	24
8	0.8	Suture	11	Yes (once)	Normal	Bulky switch flap	12
9	0.53	Suture	14	No	Normal	No	12
10	0.75	Suture	7	No	Normal	No	11
11	?	?	?	?	Normal	?	?

A indicates defect width after tumor excision; B, width of switch flap.

til flap division, especially in the case of reduced vision in the other eye. Flaps were divided at days 7 to 14 (6 cases at day 7, 3 cases at day 11, and 1 case at day 14), at which time there was no trichiasis or corneal ulcer. There was 1 case that needed a revision surgery for bulky flap of the upper eyelid. This case had its flap division at day 14 after first surgery and a B/A ratio of 0.8. The overall follow-up ranged from 3 to 36 months, with a median of 16.4 months. A comparison between preoperative and postoperative photographs showed satisfactory results with the switch flap technique. All patients were satisfied with good aesthetic results and no complications.

## Case Report

### Case 2

An 83-year-old woman was diagnosed with sebaceous carcinoma of right upper eyelid (Fig. 1A). A full-thickness wedge of upper lid tissue was excised under general anesthesia. For a 25-mm wide defect, a switch flap was designed on the pedicle of medial side in lower lid as a full-thickness flap of 22 mm in diameter to fill the defect from lower lid to upper lid (Video 1, Supplemental Digital Content 1, which is available in the "Related Videos" section of the Full-Text article on PRSGlobalOpen.com or available at <http://links.lww.com/PRSGO/A196>).

The lower lid was reconstructed by flap procedure with a propeller flap for anterior lamella and with a cartilage graft from aural scapha for the posterior lamella. One week later, the flap was divided under local anesthesia. Although the flap remained somewhat bulky then, probably because of a high B/A ratio of 0.88, neither corneal ulcer nor deformity that required revision in the lid was present 3 months postoperatively (Fig. 1B).

### Case 3

A 71-year-old man was diagnosed with sebaceous carcinoma of right upper lid (Fig. 2A). A full-thickness wedge of upper lid tissue was excised under general anesthesia. For a 20-mm wide defect, a switch flap was



**Video 1.** See video 1, Supplemental Digital Content 1, which displays an 83-year-old woman who has been diagnosed with sebaceous carcinoma of right upper eyelid. The lower lid was reconstructed with propeller flap for anterior lamella and with cartilage graft from aural scapha for posterior lamella (flap procedure). The mean of defect widths after excision of tumor (A) was 25 mm and the mean of switch flap widths (B) was 22 mm. The mean B/A ratio was 0.88, too high after surgery. This video is available in the "Related Videos" section of the Full-Text article on PRSGlobalOpen.com or available at <http://links.lww.com/PRSGO/A196>.

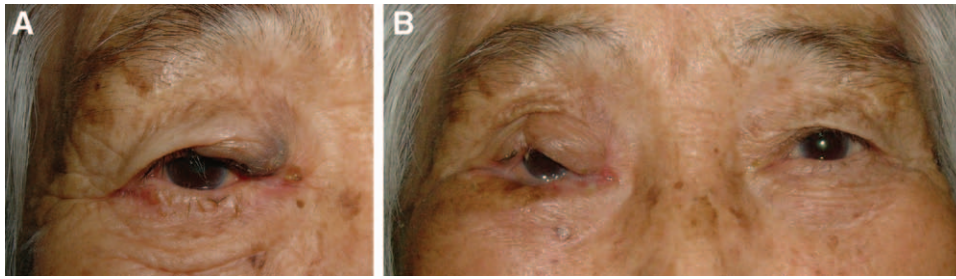
designed on the pedicle of lateral side in lower lid as a full-thickness flap of 15 mm in diameter to fill the defect from lower lid to upper lid.

The lower lid was reconstructed by primary suture (Fig. 2B). One week later, the flap was divided under local anesthesia. Thirty-six months postoperatively, neither corneal ulcer nor deformity to necessitate revision in the eyelid was present (Fig. 2C).

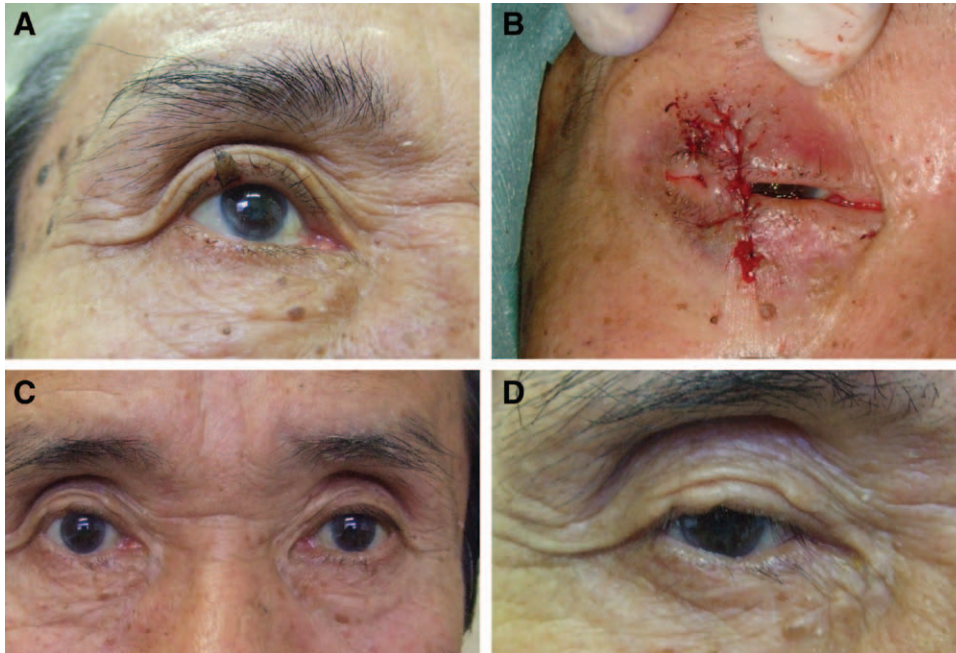
### Case 6

A 71-year-old woman was diagnosed with sebaceous carcinoma of right upper lid (Fig. 3A). A full-thickness wedge of upper eyelid tissue was excised under general anesthesia. For a 21-mm wide





**Fig. 1.** A, Preoperative view of the right eye. B, Postoperative face view at 3 months.



**Fig. 2.** A, A 71-year-old man with diagnosis of sebaceous carcinoma of right upper eyelid. Preoperative view of the right eye. B, The lower lid was reconstructed by primary suture. The mean of defect widths after tumor excision (A) was 21 mm, the mean of switch flap widths (B) was 13 mm. The mean B/A ratios was 0.62. C, Postoperative face view at 36 months. D, Postoperative view of right eye and donor site at 36 months.

defect, a switch flap was designed on the pedicle of medial side in lower lid as a full-thickness flap of 13 mm in diameter to fill the defect from lower lid to upper lid.

The lower lid was reconstructed by the flap procedure with a McGregor Z-plasty (Fig. 3B). Eleven days later, the flap was divided under local anesthesia. Twenty-four months postoperatively, neither corneal ulcer nor deformity to necessitate revision in the eyelid was present (Fig. 3C).

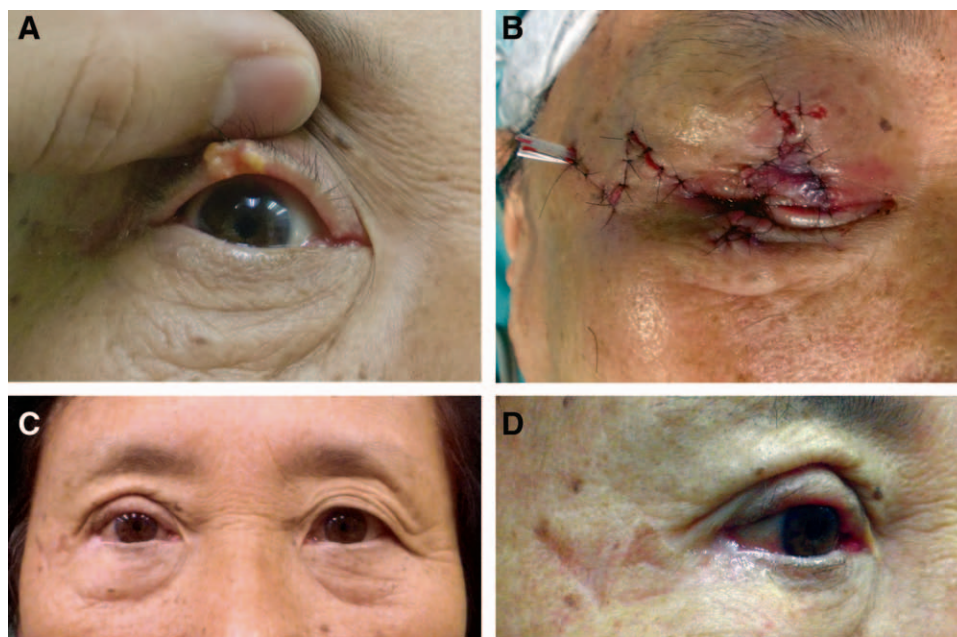
### DISCUSSION

The aim of reconstruction of a full-thickness eyelid defect is to provide the patient with a moveable lid with perfect corneal protection, good aesthetic quality, and acceptable sequelae at the donor site.<sup>7</sup>

Recommendations for periocular reconstruction are suggested based on the classification system that

analyzed various reconstructive options and the type and frequency of complications encountered.<sup>8</sup> The classical lid-sharing procedure is the Cutler-Beard bridge flap, which can cover large defects in the upper lid, without disturbing the donor lower lid margin.<sup>1</sup>

The core of the Cutler-Beard technique is to fill an upper lid defect, across the cornea, with full-thickness lower lid tissue by harvesting it there and basing it on an inferior pedicle. The flap is divided at 4 to 8 weeks after surgery at the level of the upper eyelid margin. The disadvantage of this procedure lies in the absence of tarsus, which often causes a lack of stability of the upper lid and also persistent lower lid instability, which is due to disruption of the lower eyelid retractors. Moreover, there is no lid margin or eyelashes in the reconstructed flap.<sup>2</sup> To address these limitations, several modifications to the classical Cutler-Beard flap have been proposed.<sup>2,3</sup>



**Fig. 3.** A, A 71-year-old woman with diagnosis of sebaceous carcinoma of right upper eyelid. Preoperative view of the right eye. B, The lower lid was reconstructed by flap procedure with McGregor Z-plasty. The mean of defect widths after tumor excision (A) was 20 mm, the mean of switch flap widths (B) was 15 mm. The mean of B/A ratio was 0.75. C, Postoperative face view at 24 months. D, Postoperative view of right eye and donor site at 24 months.

The switch flap, another lid-sharing flap, was originally described by Mustardé<sup>4</sup> for the correction of upper eyelid defects in 1971. In this technique, a full-thickness flap on a pedicle is switched from lower lid to upper lid to reconstruct a large full-thickness eyelid defect there. The pedicle is usually divided in 2 to 3 weeks, which is much sooner than 4 to 8 weeks needed in a Cutler-Beard flap. The switch lid flap, however, has not so far been practiced widely. That is probably because it takes somewhat higher levels of technical expertise to assure consistently good outcome. In the Mustardé method, the upper lid is reconstructed with a switch flap, whereas the donor site of the lower lid is reconstructed with primary closure or by flap procedure. Skills taken for granted in plastic and reconstructive surgery are in fact needed to get good results in the upper eyelid reconstruction as described by Mustardé<sup>4</sup> in detail in 1971.

Among the eyelid reconstruction of the defect resulting from malignant tumor, key points of the switch lid flap procedure to get good functional and aesthetic result have not been described in upper eyelids more than a quarter of the horizontal length of the eyelid before.<sup>9</sup>

Uemura and his team have used switch flaps for the repair of upper eyelid defects with satisfactory results. The main advantage of this technique is that it provides a stable movable lid with intact lid margin and eyelashes and leaves no notable deformity at the donor site. The

donor site can be reconstructed by direct closure with or without cantholysis. If the defect is so large, as in cases 2, 4, and 6 here, as to excise the whole upper lid, simple switching of lower lid to upper would cover the defect. In such cases, the large lid defect left at the donor site is reconstructed by the flap procedure with a propeller flap or a McGregor Z-plasty. Considerable difficulty has in fact been reported in obtaining good results in patients with large upper lid defects for whom a switch flap was apparently applicable.<sup>6</sup> The disadvantage of the switch flap technique may also lie in the fact that it is a 2-stage procedure and that it can cause visual handicap in most cases. The handicap would be especially acute in a 1-eyed patient as the flap covers the cornea for a long time. To lessen the visual handicap, we made it a rule, for the past 15 years, to divide the flap within 2 weeks, in 7 to 11 days in most cases, after the switch flap procedure. To get good results and less complication due to cross eyelid method, we are thinking that the pedicle should be divided earlier than usual in 2 to 3 weeks.

As a result of this protocol that we have maintained, we have seen no serious complications such as exposure keratitis and corneal ulcer. And switch flaps have taken alive with no event.

Lastly, let us discuss the width of a flap relative to the defect in upper eyelid. The width of a flap relative to the defect has never been discussed to get good aesthetic results in the past literature. Composite grafts in eyelid reconstruction was reported by Cannon et

al<sup>10</sup> in 2011. When the size of graft corresponding to defects was the same as that of the defect of resection, bulkiness was reported as one of the complications.

In switch flap procedure, the flap needs to be at least 4 mm wide to include the marginal arcade, as it is usually one-half to two-thirds of the upper eyelid defect.<sup>3</sup> This is an important point for good aesthetic results. Our analysis of the width of the size of flaps reveals that the mean of defect widths after excision of tumor (A) is 18.8 mm (range, 15–25 mm), the mean of widths of switch flaps (B) is 13.3 mm (range, 8–22 mm), which gives the mean of B/A ratios as 0.69 (range, 0.5–0.88). This mean ratio of 0.69 falls within the suitable range of 0.5–0.7 for the switch flap method, attesting to the acceptable level at which the Uemura team has treated their patients. There was one case, though, that needed a revision surgery for bulky flap of the upper eyelid. The patient had flap division at day 11 after first surgery with a B/A ratio of 0.8. This somewhat high B/A ratio of 0.8 was probably why the case ended up needing revision.

Uemura and his team found the switch flap technique to be a satisfactory method for the reconstruction of large full-thickness eyelid defects. They have experienced a high success rate with this technique; they managed, over the last 15 years, to make flaps at B/A ratios of 0.5–0.7 and divided flaps in 7 to 14 days subsequent to initial surgery—considerably earlier than in other conventional techniques for the treatment of eyelid defects resulting from resection of large tumors.

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## ACKNOWLEDGMENTS

*The authors thank many ophthalmic surgeons in Saga University Hospital and their secretary Kyoko Ohkubo at the Saga University Hospital for getting the database ready for the study.*

## PATIENT CONSENT

*Patients provided written consent for the use of their images.*

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