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ORIGINAL ARTICLE FACIAL SURGERY

Staged Mosaic Punching Excision of a Kissing Nevus on the Eyelid

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Abstract

Background A congenital divided nevus, also known as kissing nevus, is a type of congenital compound nevus that affects equal areas of the upper and lower eyelids. The edges of the nevus touch or "kiss" during closure of the lids, owing to its extension to the lid margins. Multiple treatment modalities, such as dermabrasion, cryotherapy, primary closure after excision, and skin grafts, have been proposed; however, complications such as recurrence, ectropion, skin color mismatch, and scar contractures are known to occur. This study aimed to introduce a staged excision using the 10,600-nm CO_2 pulsed laser to remove a congenital divided nevus without noticeable complications.

Materials and Methods From August 2015 to December 2018, patients with congenital divided nevus underwent staged laser excision. Seven patients underwent staged mosaic pattern punch excision with a laser. Eight patients underwent concomitant excision, and one patient underwent skin grafting of the medial canthus. Patient satisfaction was assessed immediately and at 3 months after the procedure.

Results During the study period, 15 patients (10 women and 5 men), with a mean age of 26.0 years (range 13–73 years), underwent laser excision. Continuity of the eyelid margins was maintained in 13 patients. In one patient, the eyelashes grew inward and developed inflammation. No patient developed complications during the healing process, except for partial loss of cilia. Eleven patients were very satisfied, whereas three were satisfied with the results. One patient discontinued treatment after two laser sessions.

Conclusion We performed multiple staged mosaic punching excisions of a congenital divided nevus with the CO_2 laser in 15 cases. We observed consistent therapeutic results without definite recurrence, while maintaining the continuity of the eyelid and eyelash.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Kissing nevus · Congenital divided melanocytic nevus · Staged excision · UltraPulse CO_2 laser

Hyun-Jin Cho and Won Lee have contributed equally to this work.

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Introduction

A congenital divided melanocytic nevus, also known as kissing nevus, occurs on the opposing margins of the upper and lower eyelids. It appears as a single large nevus when

the patient closes the eye and is caused by an embryological phenomenon [1]. Congenital nevi occur in approximately 1% of all newborns, with the vast majority being < 1.5 cm in size. It rarely turns malignant; however, it is a cause of psychological stress to the patient.

Numerous treatment modalities have been proposed to obliterate this rare congenital dermatologic abnormality [1]. Dermabrasion, cryotherapy, primary closure after excision, and skin grafts have been proposed [2, 3]. Dermabrasion and cryotherapy are successful techniques for obliterating congenital melanocytic nevus if the lesion is treated early in life, when the nevus cells are confined to the superficial dermis, but recurrence can occur. If the nevus involves the deep dermis and subcutaneous tissue, the treatment comprises full-thickness excision, and skin grafting is proposed. However, functional complications, such as ectropion, skin color mismatch, and scar contractures, can occur. Moreover, when the lesion involves the eyelash-bearing area, any surgical intervention might result in a noticeable scar or eyelid deformity.

Authors have experienced cases wherein functional deformity of the eyelid could be minimized through staged laser excision. Here, we introduce the staged laser excision as a treatment modality for congenital divided nevus.

Patients and Methods

Patients

From August 2015 to December 2018, patients who underwent staged mosaic pattern punching excision using a CO_2 laser were identified by retrospectively reviewing their medical records. For this type of study, formal consent is not required.

Methods

Procedure: Staged Mosaic Pattern Punching Excision Using 10,600-nm CO_2 Pulsed Laser

Patients were prepared and draped following common aseptic techniques. We used non-reflective corneal shields for eye protection. Before laser therapy, the lesions were infiltrated with local anesthetics (xylocaine, 1% lidocaine). Usually, we use the 30 G blunt cannula for Xylocaine infiltration to prevent bleeding during anesthesia. A brighter light source and magnifying glass ensure a higher accuracy of the procedure.

The concept of the procedure is to avoid obliterating the nevus completely in a single stage, but to remove it gradually, thus optimally preserving the aesthetic structures, such as the eyelash-bearing area and eyelid margin. We used a 10,600-nm CO_2 pulsed laser (UltraPulse®, wavelength 10 Hz, impulse, pulse duration = 250 μs, Smart PS, UTI). Impulses of 500 mJ were used to obliterate the actual nevus. The partial laser excision was circular in shape. To begin with, the round shape was created using the CO_2 laser; the nevus was then grasped using micro-forceps, and the excision was deepened. Between 20 and 30 passes were made for the macroscopic removal of lesions. The laser excision procedure is very different from the conventional CO_2 ablation. Ablation usually results in thermal damage to the surrounding normal tissues and affects the normal wound-healing process. To prevent damage to the normal tissue and induce optimal secondary wound healing, only the site of the nevus is excised with micro-forceps, and the deeper nevus tissue is removed with a laser. The excision of the lesions includes full thickness of the dermis, with a thin layer of superficial fat, to ensure the removal of all dermal elements. Once an adequate depth at the margins is achieved, the nevus is pulled from the skin and the bleeding vessels are coagulated. The diameter of the excised skin region of the eyelid was < 4 mm. The diameter of the excised skin should be at least 2 mm to avoid interruption in wound healing. The width of the laser excision was < 3 mm in the eyelash-bearing lid area. Care needs to be taken to prevent thermal damage to the hair follicles. Once the treated lesions are epithelialized, the next laser session is performed. Three-to-six treatment sessions on an average are required for completion of the procedure (Fig. 1). Concomitant excision or skin graft was performed in patients with a large nevus involving the periorbital area. The entire procedure was performed every 4–6 weeks (Supplemental Digital Content 1, Video shows the staged mosaic punching excision using CO_2 laser).

Postoperative Care

To protect the typical post-therapeutic erosions, ophthalmic antibiotic ointment is applied every 4 h for 3 days. This immediate post-therapeutic treatment is followed by a topical antibiotic ointment every 8 h for another 7 days.

Post-procedural Evaluation

The scars were photographed to enable the surgeons to rate the scar appearance later. The scars were visually assessed by two other surgeons. The assessment comprised checking for postoperative irregularity of the lid margin, including lid notching, any complications, delayed wound healing, infection of the lid, and total or partial decrease in hair along the lid margin. Delayed wound healing was defined as complete re-epithelialization requiring more than 4 weeks. The period required for wound healing after circular excision was evaluated. Complete closure of the

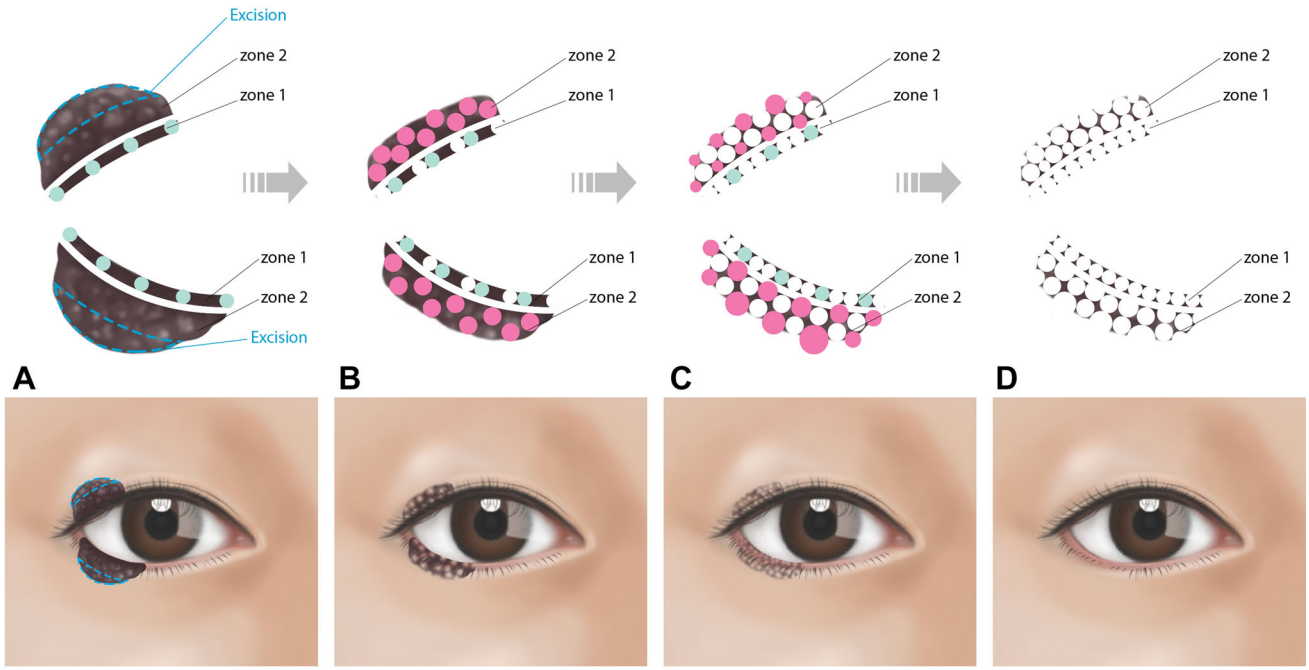

Fig. 1 Schematic illustration of the staged mosaic punching laser excision. **a** In the first step, surgical excision of the lesion on the eyelid crease and laser excision of the eyelash-bearing area are performed. The eyelash-bearing area should be removed in at least 4-mm intervals with a diameter of < 2–3 mm in consideration for the hair follicle. **b** The lesion on the eyelid margin is 4 mm in diameter, and staged excision is performed on the eyelash-bearing area avoiding healing by secondary induction. **c** Staged excision of the lesion. **d** Postoperative status. Continuity of eyelid ciliary margins is maintained

wound was considered as complete healing. The wound was assessed for infection, swelling, and redness, which could require medical or surgical intervention. Recurrence was defined as redevelopment of a pigmented lesion, measuring more than 50% of the treated area, requiring repeat laser excision. Every 3 months, the patient was followed up for any recurrence. Patient satisfaction was assessed subjectively using a questionnaire, in which the patients were asked to rate their degree of satisfaction in terms of result and treatment convenience on a 4-point scale (0, worse; 1, little satisfaction or not satisfied; 2, satisfied; and 3, very satisfied). The questionnaire was administered to the patients at the end of the treatment and after 90 days (Figs. 2 and 3).

Results

During the study period, 15 patients (10 women and 5 men) with a mean age of 26.0 years (range 13–73 years) underwent laser excision. All cases involved the eyelash-bearing area. Eight of the congenital nevi were small (< 1.5 cm) and only involved the upper and lower eyelids. Four lesions were medium-sized (range 1.5–19.9 cm) and involved the medial or lateral canthus. Seven patients underwent only laser therapy, and eight patients underwent concomitant excision or had a history of previous excision, and one patient underwent skin graft over the area of the medial canthus. The mean epithelialization period was 3.1 ± 0.6 weeks. The patients underwent laser excision at least once for 3 months. At least 2 sites on the eyelash-bearing area were excised, with at most 4 sites per session. The mean follow-up period was 10 months (range 3–19 months), with no definite recurrence observed in the wound bed requiring repeat laser excision during the follow-up period. One patient discontinued treatment after two laser sessions (Table 1).

The functional and cosmetic results were satisfactory in all patients. Continuity of the eyelid ciliary margins was maintained in 13 patients. Acceptable minimal irregularity was formed as a serial semicircular scar (diameter < 2 mm) along the lid margin. Partial loss of cilia was observed in all patients. More than 50% of the upper eyelashes were preserved, and less than 50% of the lower eyelashes in the treated area were lost. However, lid continuity was maintained. In one patient, the eyelashes grew inward and developed inflammation. No patient had significant complications, such as ectropion, corneal erosion, trichiasis, or hypertrophic scar. Residual lesions were found in less than 10% of the excision area after re-epithelialization. These were thought to be marginal or local remnant lesions rather than recurrences. This was resolved with immediate shallow adjunctive ablation, independent of mosaic excision. The need for repeat adjunctive

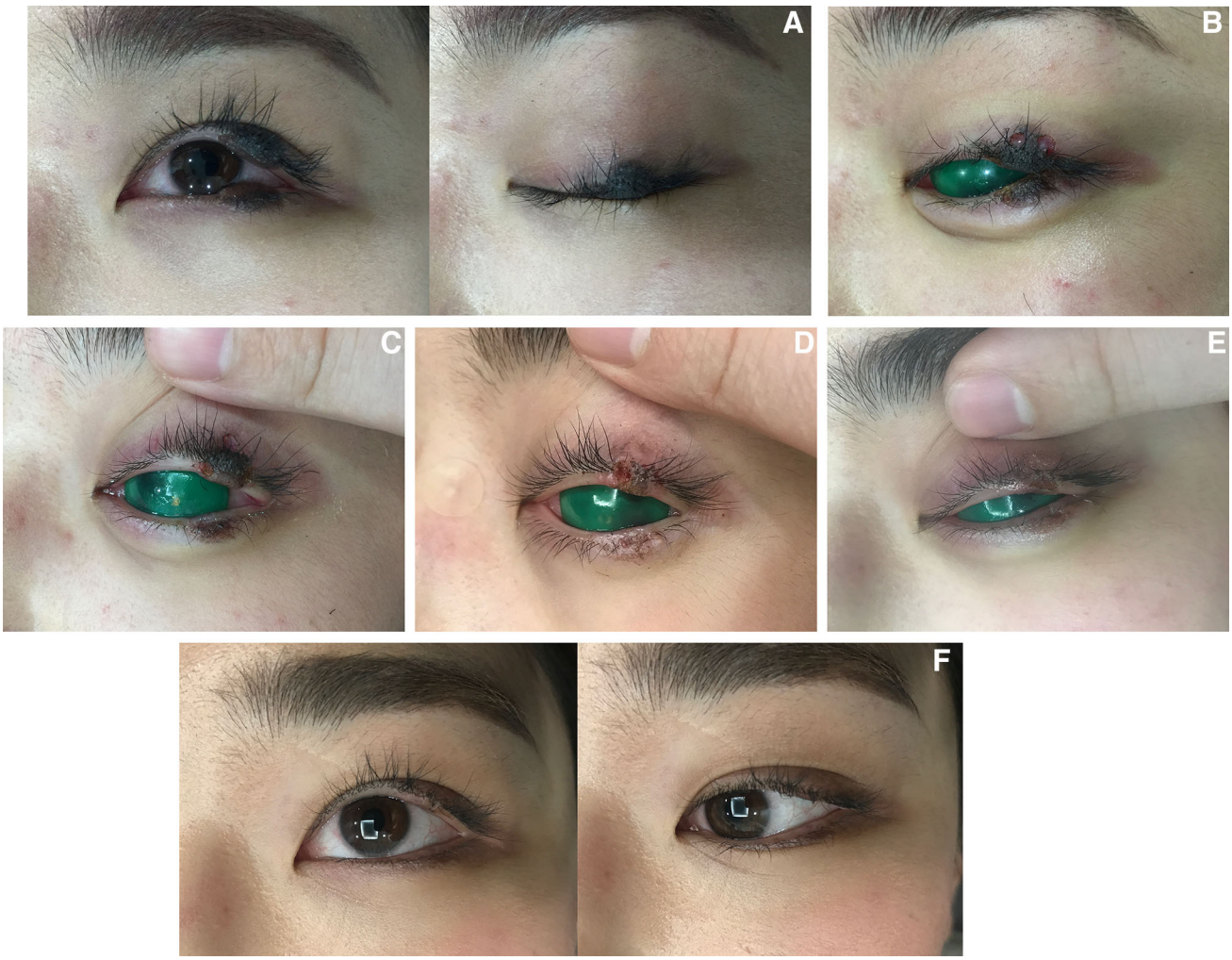

Fig. 2 A 25-year-old female patient with congenital eyelid kissing nevus. **a** Pre-procedural status. **b** Immediately after the first punch excision can be checked with a photograph after one laser session. No bleeding in the wound bed is observed, and full-thickness excision was performed with a diameter of ≤ 4 mm and at least 4-mm intervals. **c** Immediately after the second session of laser therapy. **d** Immediately after the fourth session of laser therapy. **e** Immediate status after the fifth session. The remaining lesion was resolved with immediate shallow adjunctive ablation, independent of mosaic excision. **f** After six sessions, no eyelid deformity is observed, and the density of eyelash is decreased but looks natural. No evidence of recurrence was noted 19 months after laser treatment

treatments differed between patients (average 2 times, range 0–5 times). The satisfaction assessment, performed immediately after the procedure, revealed that all patients were very satisfied. Three months after the procedure, 11 patients rated that they were "very satisfied," while three patients rated "satisfied" in the patient satisfaction questionnaire.

Discussion

We performed a staged laser excision with mosaic pattern to obliterate the congenital divided nevus because very precise excision at the ciliary margin and eyelids was required. The method is based on the concept of precise excision of the nevus rather than laser ablation. This method minimizes thermal damage to the hair follicles while achieving deep excision and coagulation of the wound bed at the same time.

Because the congenital divided nevus is located at the ciliary margin, it can result in poor aesthetics or impair the lid function. Treatments described in previous studies usually involved resolution of only the periorbital nevus lesions, and there are no definitive and invasive measures for a ciliary margin lesion [2–4]. The ultimate goal of treatment for congenital divided nevus is not just excision of the periorbital region, but also an appropriate intervention at the ciliary margin, including the eyelash-bearing area. The lid margin has important functions, such as lubricating the ocular surface and maintaining a smooth

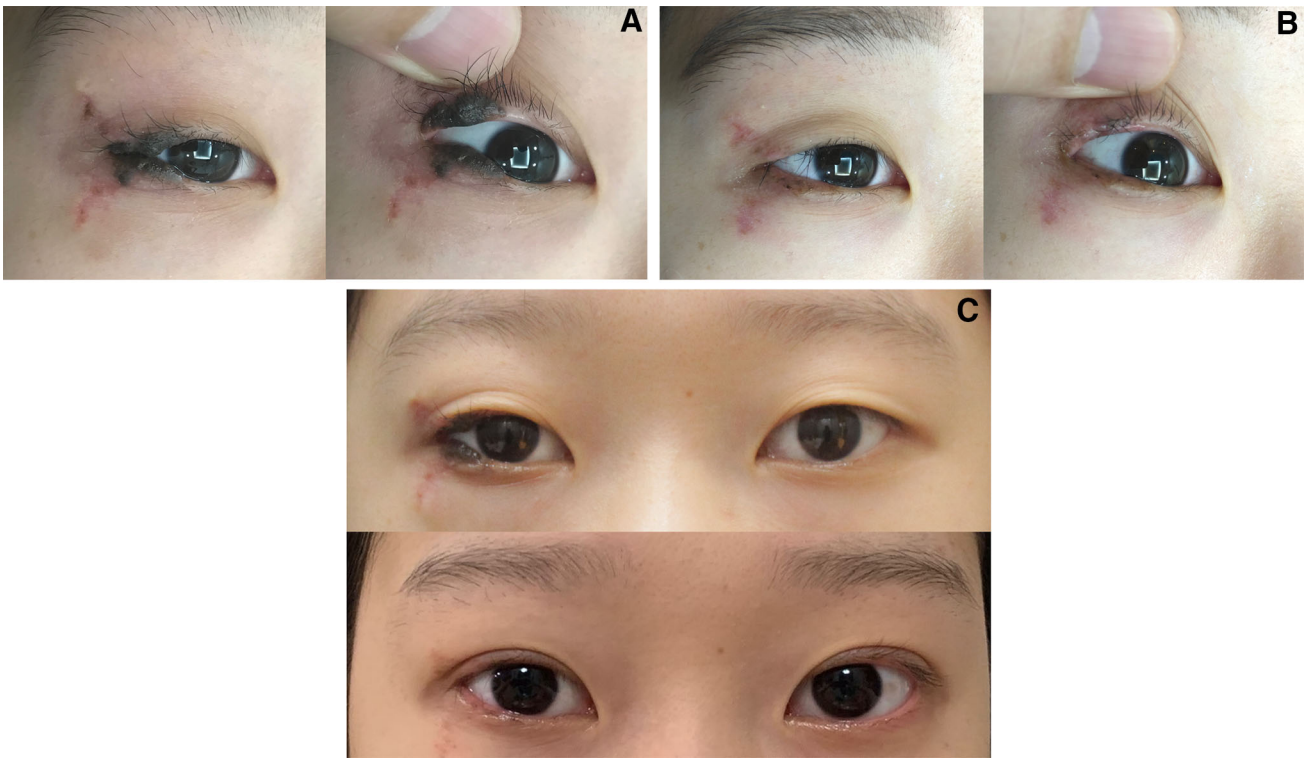

Fig. 3 An 19-year-old female patient. **a** Pre-procedural status. During a hospital visit, the patient had received two excuses for periocular lesions at another hospital. **b** After five laser procedures, more than 90% of the lid margin is removed, and acceptable minimal irregularity of the eyelash-bearing area was formed as a semicircular scar along the lid margin. **c** Pre-procedural (upper) and post-procedural (lower) status

Table 1 Patient demographics

Case	Age (years)	Sex	Rt/Lt	Size (cm)	Involvement	No. of sessions	Concomitant procedure	Previous treatment
1	21	F	L	1.0		6		
2	19	F	R	1.0		5		Excision
3	43	M	L	0.9		3		
4	22	F	L	1.2		4		
5	24	F	L	1.0		3		
6	24	M	R	1.0		4		
7	21	F	R	2.0	Medial canthus	6		Excision, skin graft
8	31	F	R	1.6		7		Excision
9	73	F	R	1.5		3	Excision	
10	17	M	L	1.3		3	Excision	
11	23	F	R	1.8		3	Excision	
12	15	M	R	1.5	Lateral canthus	3		
13	20	F	L	3.5		2		
14	24	F	L	3.5		1	Excision	
15	13	M	R	2.0		2	Excision	

margin, to prevent ocular irritation. Furthermore, continuity of the lid margin is important for shape of the orbital fissure. A therapeutic approach involving CO_2 laser ablation has already been reported [5]. Superficial ablation described in previous studies might be able to avoid dimpling, but might leave a remnant nevus.

We attempted optimal preservation of the shape of eyelids, and a stepwise treatment to induce re-epithelialization without any noticeable scar and lead to good results

was utilized because thermal injury can damage hair follicles. All full-thickness skin wounds heal by contraction and epithelialization. Healing by secondary intention is cost-effective and allows observation for recurrence in high-risk cases. Moreover, tissues in the periocular region are highly vascular and can easily achieve granulation. A previous article described that ulcers < 4 mm usually result in a flat scar after deep ablation [6]. Considering the wound-healing process, we have eliminated a large amount that can be removed. We performed complete deep excision using a CO_2 laser. Although multiple rounds of ablation might be required, wounds of the lower lids are reported to heal with acceptable results.

Laser excision would be performed, such as punch biopsy, and control of bleeding of the wound bed is also required. The UltraPulse® CO_2 laser is one of the best devices for precise excision and simultaneous control of bleeding. The CO_2 laser beam (10,600 nm wavelength) is selectively absorbed by the extracellular fluid of biological tissues, leading to nonspecific vaporization and tissue photocoagulation. It emits extremely short light pulses (600–900 μs) with high peak energies (up to 500 mJ). As the pulse duration lasts well beyond the thermal relaxation time of the skin, thermal damage to the surrounding tissue is avoided. Fitzpatrick et al. have shown that the skin is ablated to a depth of up to 60 μm by a single 10,600-nm CO_2 pulsed laser treatment of 250-mJ impulses. A second consecutive laser application increases the depth of the damage to 130 μm. A third application leads to thermal destruction of skin structures to a depth of up to 316 μm [7].

This study shows that a delicate obliteration of the congenital kissing nevus of the eyelid using the UltraPulse CO_2 laser achieves effective removal and minimizes damage to the eyelash-bearing area. It also allows the removal of delicate deeper structures, thereby preventing the occurrence of post-therapeutic scarring and lasting pigmentary changes.

Conclusion

We performed multiple stage mosaic punching excision of the congenital divided nevus using a 10,600-nm CO_2 pulsed laser in 15 cases. We observed the consistent therapeutic results without definite recurrence, while maintaining the continuity of the eyelid and eyelash.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest to disclose.

Ethical Approval The need for informed consent was waived by the institutional review board of the Cheil General Hospital because the study was retrospective. The study conformed to the principles of the Declaration of Helsinki.

Informed Consent For this type of study, informed consent is not required.

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