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Femtosecond laser-assisted excision of conjunctival melanocytic lesions: Cosmetic and long-term outcomes

Conjunctival naevi and primary acquired melanosis, when large or conspicuous, can be removed for aesthetic purposes. Surgical excision, however, may result in conjunctival erythema, scarring, neovascularization and possibly unsatisfactory cosmesis especially with large, superficial, pigmented naevi. Conjunctival scarring is also more common when Tenon's capsule is resected along with the lesion.¹

The Z8 (Ziemer Ophthalmic Systems AG, Switzerland) is a low-energy, high-frequency femtosecond laser (FSL) system that can cut translucent tissue including conjunctiva.² We report our series of five patients who underwent removal of benign pigmented conjunctival lesions for cosmesis or mild changes in size or morphology using the Z8 FSL from January 2017 to December 2018. The study was approved by the SingHealth Centralised Institutional Review Board (number: 2016/2512).

Surgeries were performed under peribulbar anaesthesia. A 7-0 vicryl traction suture applied to the superior limbal cornea and the eye rotated. Figure 1 shows the pertinent steps. The lamellar keratoplasty module was programmed to dissect the conjunctiva containing the lesion at a depth of 60 µm and with 2-mm tumour-free margins. Energy was set at 150% for the horizontal stromal lamellar cut and 130% for the side cuts. A 0.2 to 1.0-mm oversized conjunctival autograft (CAG) from the superior bulbar conjunctiva was resected in a similar fashion with a lower energy setting of 100% for the horizontal lamellar cut. Fibrin glue (Artiss; Baxter) was applied to the recipient scleral bed, the CAG inverted and positioned to cover the defect and a contact lens placed. Dexamethasone and levofloxacin 0.5% eye drops were applied every 3 hours for 1 week and tapered off over a month. External eye photos

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FIGURE 1 Steps involved in the femtosecond laser (FSL) resection of conjunctival melanosis and harvest and gluing of a conjunctival autograft. A, The Z8 FSL handpiece was docked over the centre of the melanosis and programmed to B, dissect an ellipsoid of conjunctiva containing the lesion, which was peeled off with forceps. C, The handpiece was then docked onto the superior bulbar conjunctiva and used to resect a slightly oversized autograft. D, Intraoperative optical coherence tomography was used to confirm complete resection of a free autograft (yellow dotted lines). E, The autograft was then carefully, F, peeled off and G, glued in place over the conjunctival defect

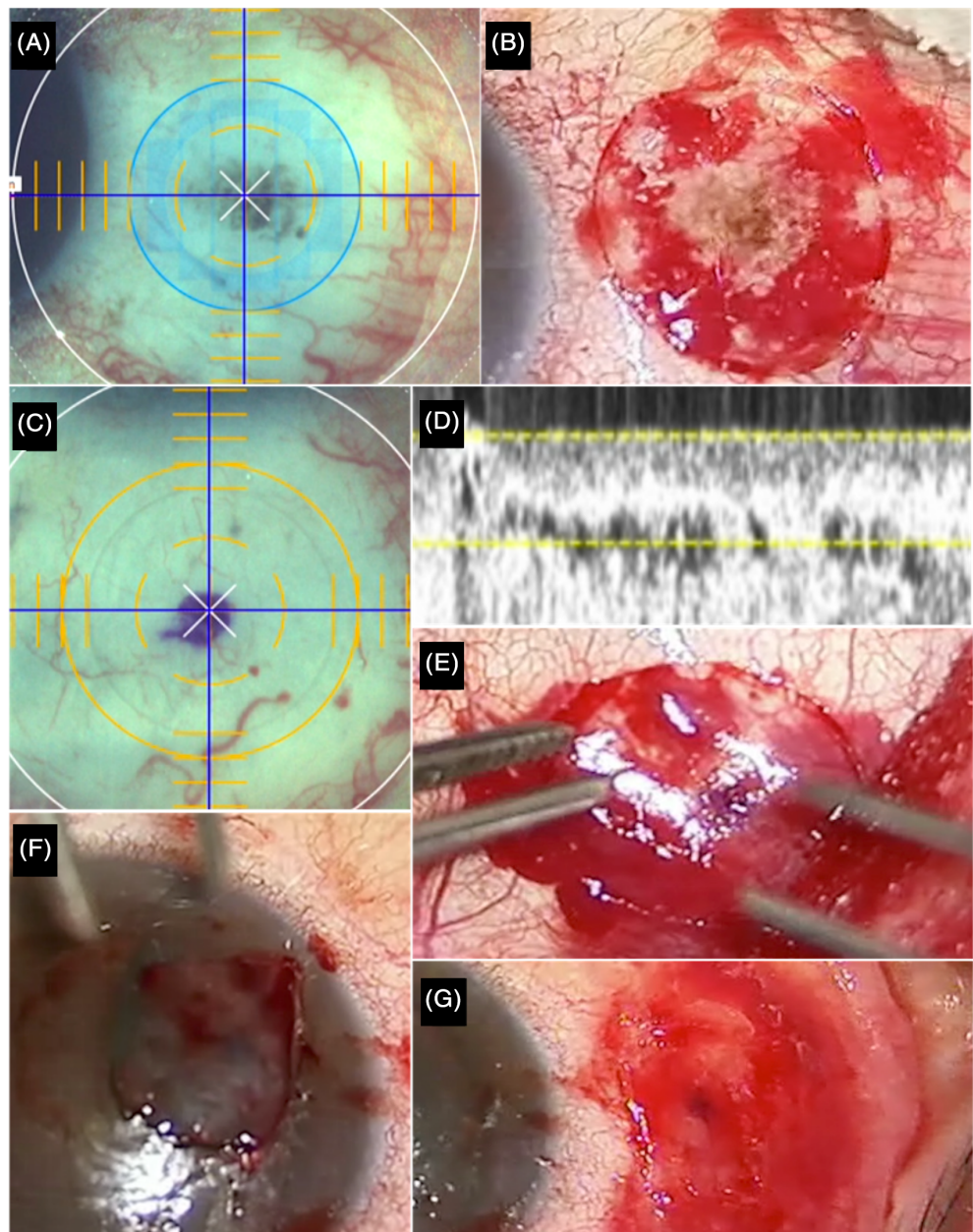


TABLE 1 Demographic, preoperative and postoperative clinical features and outcomes of the five patients who underwent femtosecond laser (FSL) resection of benign pigmented conjunctival lesions

	Age/gender	Eye	Location of lesion	Reason for removal	Histopathology	Cosmetic outcomes at 1 month and 1 year
Patient 1	17/M	Left	Temporal	Growth	Benign compound naevus	2,2
Patient 2	85/F	Right	Temporal	Change in pigmentation, malignant ciliary body tumour in the other eye	Subepithelial naevus	2,2
Patient 3	37/F	Left	Temporal	Growth	Hypermelanosis without atypia	1,1
Patient 4	48/F	Left	Nasal	Cosmesis	Melanosis without atypia	1,1
Patient 5	16/F	Left	Temporal	Cosmesis	Melanosis without atypia	1,1

Note: There were four females and one male, with a median age of 37 years (range 16-85 years). All patients were of Chinese descent. Among the lesions, four were temporal and one was nasal in location. Cosmetic outcomes were graded as follows: 1 = excellent, 2 = good, 3 = fair, 4 = poor and 5 = ungradable.

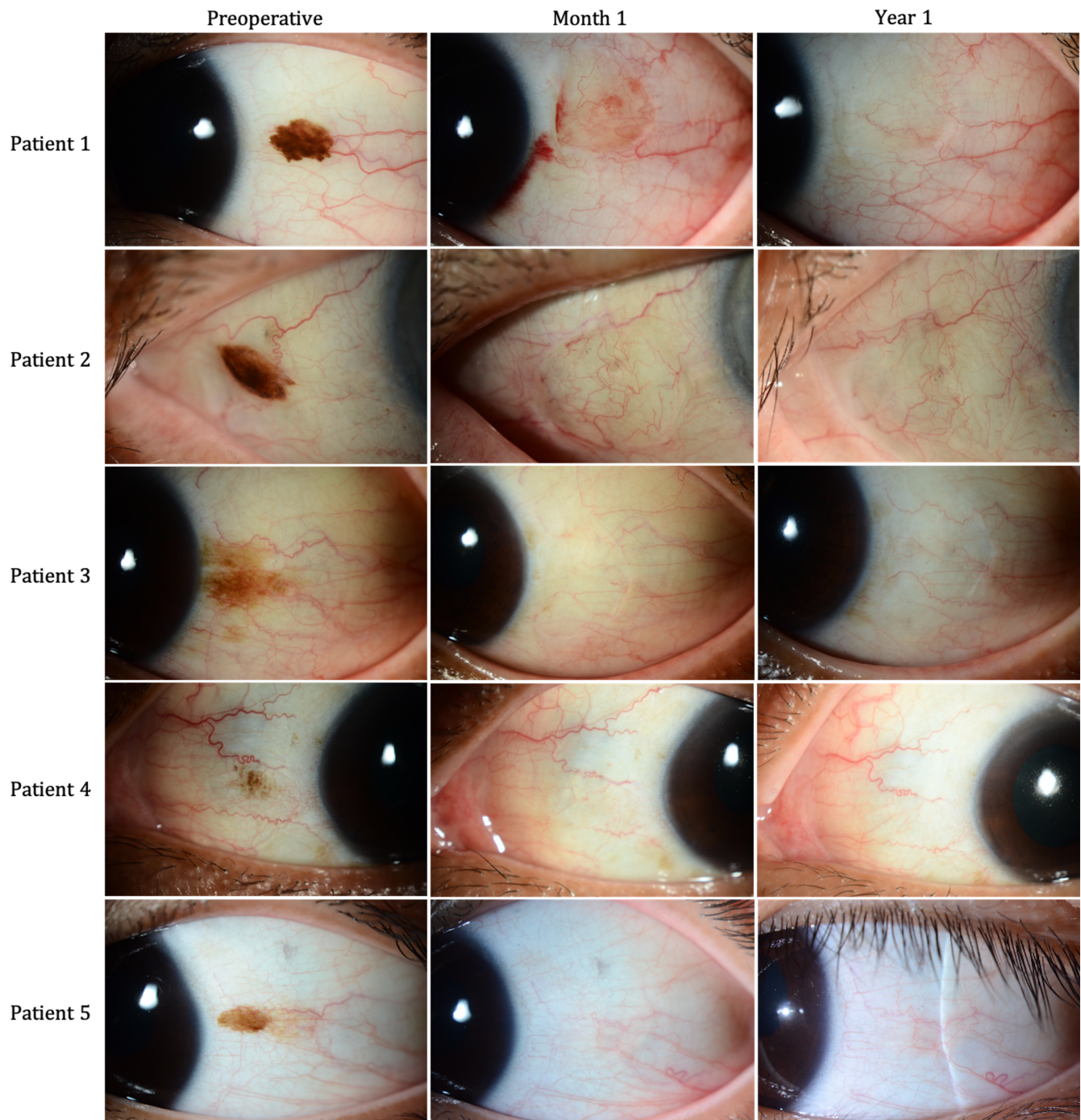


FIGURE 2 Preoperative and postoperative images of the five patients who underwent femtosecond laser (FSL) resection of pigmented conjunctival lesions. Histopathologic analysis showed conjunctival naevus in patients 1 and 2, and conjunctival melanosis in patients 3, 4 and 5. Good cosmesis was attained in the two naevus cases and excellent cosmesis in the three melanosis cases at 1 month and 1 year after surgery

taken after 1 month and 1 year were retrieved, and cosmetic outcomes graded by a masked observer according to an adaptation of the six-level web-based scale proposed by Hirst for grading cosmesis after pterygium surgery: 1 = normal appearing conjunctiva (excellent), 2 = mild conjunctival vascular changes (good), 3 = moderate conjunctival vascular changes (fair), 4 = definite conjunctival scarring (poor) and 5 = ungradable.³

The Z8 was programmed to resect the conjunctival lesions at sizes ranging from 5.0×5.0 mm to 9.0×7.0 mm (median 7.0×6.0 mm). The duration of dissection ranged from 13 to 25 seconds (median 21 seconds). No complications such as buttonholes, burns or excessive bleeding were noted intraoperatively.

At 1 month, all five patients had healed surgical and donor sites with no conjunctival epithelial defect



or graft retraction. No scarring was observed in the superior conjunctivae. Histopathologic analysis showed two cases of naevi and three cases of melanosis (Table 1). Figure 2 shows preoperative and postoperative photos of the five patients at 1 month and 1 year. Good cosmesis was attained in the two naevus cases, and excellent cosmesis in the three melanosis cases (Table 1). There was no recurrence of conjunctival lesions for all patients at 1 year.

Recent studies have shown that the FSL enables fast preparation of customized, uniform, ultrathin CAGs with minimal inclusion of Tenon tissue, independent of surgeon experience.^{2,4} Complications associated with excessive inclusion of Tenon tissue such as graft retraction and recurrence are thus avoided. The Z8 can dissect ellipsoids from 5 to 10 mm in diameter, at 60 to 2000- μ m depth. The use of the FSL for conjunctival autografts has also been associated with minimal postoperative swelling, excellent healing and absence of scarring of the superior conjunctival harvest site.⁴

The main advantage of the Z8 in its application to conjunctival surgery is its articulating handpiece, which enables easy appplanation over conjunctival lesions and the superior bulbar conjunctiva. In addition, the Z8's large numerical aperture enables it to cut efficiently through conjunctiva, wherein energy penetrance is decreased compared to corneal tissue due to its translucency.⁴ Moreover, the Z8 FSL delivers lower energy pulses in the nanojoules range as opposed to microjoules.⁵ This reduces intraoperative tissue inflammation, which may in turn minimize postoperative scarring. We used higher energy settings than conventional corneal stromal lamellar cuts (150% vs 90%). Another advantage of the Z8 is that suction is not needed for dissection, thus avoiding complications related to increased intraocular pressure.

Cosmetic outcomes were slightly more favourable in the patients who had a histopathologic diagnosis of melanosis although a definite conclusion cannot be drawn due to the small study size. The higher density of pigmentation in naevi may have limited the penetration of laser energy through the tissue, resulting in less-efficient dissection. Aside from the density of lesion pigmentation, another factor affecting the efficacy of the FSL in defining the lamellar plane is lesion thickness. Lesions thicker than 150 μ m are more difficult to peel off from the conjunctival bed. Laser settings could be adjusted according to the morphology of the lesion to be resected.

Although the use of the FSL in conjunctival surgery is emerging, it is not yet widely adopted due to the associated costs. We encourage institutions already equipped with an FSL to consider its application in the excision of benign pigmented conjunctival lesions and preparation of ultrathin CAGs.

CONFLICT OF INTEREST

None declared.

ETHICS STATEMENT

Ethics approval for this study was obtained from the SingHealth Centralised Institutional Review Board.

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