• Letter to the Editor •

Contrasting filtering bleb formation following Preserflo MicroShunt implantation before and after anti-IL-4 receptor alpha antibody therapy in a patient with atopic dermatitis

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Dear Editor,

In glaucoma filtration surgery, suppression of postoperative conjunctival fibrotic scar formation is a critical determinant of intraocular pressure (IOP) control[1]. Therefore, novel antifibrotic treatments are needed to improve surgical outcomes. Interleukin (IL)-4 and IL-13, type-2 cytokines, are overexpressed in the conjunctiva of patients with severe allergic or cicatricial ocular surface diseases[2-4], promoting conjunctival fibrosis[5-6]. Therefore, these cytokines may contribute to postoperative bleb scarring when glaucoma filtration surgery is performed in patients with ocular allergy. Dupilumab, an IL-4 receptor-α antibody that inhibits the signaling of both IL-4 and IL-13 and is widely used for various type 2 inflammatory disorders, including atopic dermatitis, asthma, and chronic rhinosinusitis with nasal polyposis, chronic spontaneous urticaria, prurigo nodularis, bullous pemphigoid, chronic obstructive pulmonary disease, and eosinophilic esophagitis[7]. Here, we report a case in which postoperative subconjunctival scarring following filtration surgery was attenuated after dupilumab therapy.

Ethical Approval As this is a single-case report, IRB review and approval was waived according to the Ethical Guideline for Clinical Research issued by Ministry of Health, Welfare and Labour, Japan. A written informed consent was obtained from the patient.

CASE PRESENTATION

A 56-year-old man was referred for glaucoma surgery. Despite treatment with topical carteolol hydrochloride, topical latanoprost, and oral acetazolamide, his IOP remained 20 mm Hg in both eyes. The patient had atopic dermatitis since infancy (onset at 8mo), which was managed with topical corticosteroids. The patient had developed severe allergic reactions and blepharitis to other glaucoma eye drops; therefore, additional topical medications were contraindicated. Accordingly, a PreserFlo MicroShunt (Santen Pharmaceutical Co., Ltd., Osaka, Japan) was implanted in his right eye. Both procedures were performed by the same surgeon at the same clinic using the same technique. During surgery, surgical sponges soaked in 0.4 mg/mL mitomycin C were applied to the scleral surgical site for 3min to prevent bleb scarring. The patient was advised to stop using all IOP-lowering eye drops immediately after the surgery. Additionally, betamethasone sodium phosphate eye drops were applied twice daily for 2wk preoperatively and four times daily for 3mo postoperatively. This perioperative regimen was identical for both eyes. Postoperatively, a localized bleb formed (Figure 1A), and the IOP rose above 10 mm Hg within 2wk (Figure 2). The Indiana Bleb Appearance Grading Scale[8] score was H2, E1, V0, S0 in right eye. Two months after surgery, anti–IL-4 receptor α antibody therapy (dupilumab) was initiated for atopic dermatitis, resulting in marked improvement in the skin condition of the patient. Five months after starting dupilumab, a PreserFlo MicroShunt was implanted in the left eye. In contrast to the right eye, a diffuse bleb formed in the left eye (Figure 1B), and the IOP remained below 10 mm Hg throughout follow-up (Figure 2). The Indiana Bleb Appearance Grading Scale score was H2, E3, V1, S0 in left eye. At present

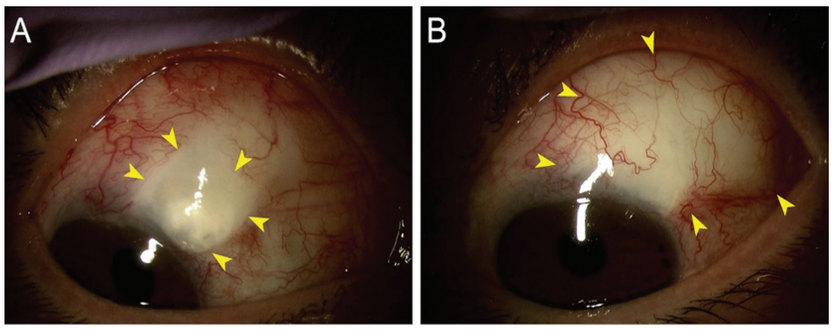


Figure 1 Slit lamp images of bleb formation in the conjunctiva of the patient who underwent PreserFlo MicroShunt implantation surgery before (A) and after (B) dupilumab treatment A: A localized, avascular bleb formed in the right eye; B: In contrast, a widespread bleb formed in the left eye.

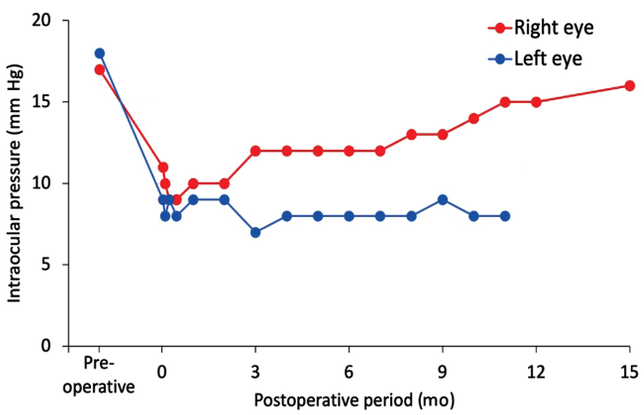


Figure 2 Longitudinal profile of intraocular pressure before and after surgery.

(18mo postoperatively for the right eye and 11mo for the left), without glaucoma medications, the IOP was 15 and 8 mm Hg in the right and left eye, respectively.

DISCUSSION

This study is the first to describe the formation of a bleb following glaucoma filtration surgery before and after dupilumab treatment. In the present case, PreserFlo MicroShunt implantation surgery following dupilumab treatment resulted in larger bleb and greater reduction in IOP. This case suggests that IL-4/IL-13 inhibition by dupilumab may suppress conjunctival scarring after glaucoma filtration surgery in patients with atopic dermatitis.

Elevated levels of IL-4 and IL-13 have been demonstrated in the conjunctiva of patients with atopic keratoconjunctivitis, ocular cicatricial pemphigoid, or mucous membrane pemphigoid[2-4]. These cytokines act on conjunctival fibroblasts through the IL-4 receptor α, promoting cellular proliferation, enhancing collagen lattice contraction, and exerting antiapoptotic effects[4-5,9]. Additionally, IL-4 and IL-13 stimulate collagen synthesis while suppressing matrix metalloproteinase production, thereby contributing to fibroproliferative changes in the conjunctiva[5-6,10]. Consequently, these type 2 cytokines contribute to the formation of conjunctival giant papillae in patients with vernal keratoconjunctivitis[11-12] and conjunctival fibroproliferative changes in patients with ocular cicatricial pemphigoid. Accordingly, cases of patients with atopic or vernal keratoconjunctivitis with conjunctival giant papillae regressed following dupilumab treatment have been reported[13]. Overall, these cytokines might also contribute to postoperative fibrosis, scarring, and shrinkage of the bleb in patients with atopic dermatitis following glaucoma filtration surgery. In the present case, filtration surgery performed after initiating dupilumab therapy was associated with reduced fibrosis of the bleb and formation of a larger bleb. This effect is attributed to the inhibition of IL-4/13 signaling by dupilumab.

Dupilumab has also been reported to paradoxically induce ocular surface inflammation including conjunctivitis, blepharitis, keratitis, and dry eye in patients with atopic dermatitis[14]. The mechanism underlying these adverse reactions is not fully understood; however, one hypothesis suggests that a shift toward Th1/Th17-type immune responses caused by the dupilumab-induced inhibition of Th2 cytokine signaling may cause inflammation[15]. Further studies are needed to evaluate the effect of dupilumab on filtration surgery for glaucoma.

Among allergic diseases, atopic dermatitis is associated with the highest risk of developing glaucoma in a nationwide cohort study in Korea[16]. In addition, patients with glaucoma and severe atopic dermatitis are reportedly considerably more likely to require surgery[17]. Takakuwa *et al*[18] proposed atopic glaucoma as one of the clinical entities of atopic ocular complications and atopic glaucoma tends to be severe and accompanied by inflammatory responses. Therefore, glaucoma management in patients with atopic dermatitis is a clinical challenge. Although this single-case report cannot prove a cause-and-effect relationship, dupilumab may warrant further investigation as a potential adjunctive agent for glaucoma filtration surgery in patients with atopic dermatitis.

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investigation, visualization, writing–original draft; Fukuda K: Conceptualization, visualization, writing–original draft, writing–review & editing; Yamashiro K: Supervision, writing–review & editing.

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REFERENCES

1 Yu DY, Morgan WH, Sun XH, *et al*. The critical role of the conjunctiva in glaucoma filtration surgery. *Prog Retin Eye Res* 2009;28(5):303-328.

2 Matsuura N, Uchio E, Nakazawa M, *et al*. Predominance of infiltrating IL-4-producing T cells in conjunctiva of patients with allergic conjunctival disease. *Curr Eye Res* 2004;29(4-5):235-243.

3 Razzaque MS, Ahmed BS, Foster CS, *et al*. Effects of IL-4 on conjunctival fibroblasts: possible role in ocular cicatricial pemphigoid. *Invest Ophthalmol Vis Sci* 2003;44(8):3417-3423.

4 Saw VP, Offiah I, Dart RJ, *et al*. Conjunctival interleukin-13 expression in mucous membrane pemphigoid and functional effects of interleukin-13 on conjunctival fibroblasts *in vitro*. *Am J Pathol* 2009;175(6):2406-2415.

5 Fujitsu Y, Fukuda K, Kumagai N, *et al*. IL-4-induced cell proliferation and production of extracellular matrix proteins in human conjunctival fibroblasts. *Exp Eye Res* 2003;76(1):107-114.

6 Leonardi A, Cortivo R, Fregona I, *et al*. Effects of Th2 cytokines on expression of collagen, MMP-1, and TIMP-1 in conjunctival fibroblasts. *Invest Ophthalmol Vis Sci* 2003;44(1):183-189.

7 McCann MR, Kosloski MP, Xu C, *et al*. Dupilumab: Mechanism of action, clinical, and translational science. *Clinical Translational Sci* 2024;17(8):e13899.

8 Cantor LB, Mantravadi A, WuDunn D, *et al*. Morphologic classification of filtering blebs after glaucoma filtration surgery: the Indiana Bleb Appearance Grading Scale. *J Glaucoma* 2003;12(3):266-271.

9 Fujitsu Y, Fukuda K, Kimura K, *et al*. Protection of human conjunctival fibroblasts from NO-induced apoptosis by interleukin-4 or interleukin-13. *Invest Ophthalmol Vis Sci* 2005;46(3):797.

10 Fukuda K, Fujitsu Y, Kumagai N, *et al*. Inhibition of matrix metalloproteinase-3 synthesis in human conjunctival fibroblasts by interleukin-4 or interleukin-13. *Invest Ophthalmol Vis Sci* 2006;47(7):2857-2864.

11 Kumagai N, Fukuda K, Fujitsu Y, *et al*. Role of structural cells of the cornea and conjunctiva in the pathogenesis of vernal keratoconjunctivitis. *Prog Retin Eye Res* 2006;25(2):165-187.

12 Fukuda K, Kumagai N, Fujitsu Y, *et al*. Fibroblasts as local immune modulators in ocular allergic disease. *Allergol Int* 2006;55(2):121-129.

13 Fukuda K, Ebihara N, Kishimoto T, *et al*. Amelioration of conjunctival giant papillae by dupilumab in patients with atopic keratoconjunctivitis. *J Allergy Clin Immunol Pract* 2020;8(3):1152-1155.

14 Utine CA, Li G, Asbell P, *et al*. Ocular surface disease associated with dupilumab treatment for atopic diseases. *Ocul Surf* 2021;19:151-156.

15 Thormann K, Lüthi AS, Deniau F, *et al*. Dupilumab-associated ocular surface disease is characterized by a shift from Th2/Th17 toward Th1/Th17 inflammation. *Allergy* 2024;79(4):937-948.

16 Han K, Jung JH, Jung Y, *et al*. The risk of open angle glaucoma in young adults with allergic diseases: a Nationwide cohort study. *Sci Rep* 2024;14(1):10694.

17 Chu YY, Lee CY, Huang WY, *et al*. Association of atopic dermatitis and risk of glaucoma surgery: a global population-based study. *J Glaucoma* 2024;33(10):735-741.

18 Takakuwa K, Hamanaka T, Mori K, *et al*. Atopic glaucoma: clinical and pathophysiological analysis. *J Glaucoma* 2015;24(9):662-668.