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Contents

Thrice Monthly Volume 10 Number 27 September 26, 2022

OPINION REVIEW

- 9550** Psychiatric disorders and pain: The recurrence of a comorbidity
Vyshka G

REVIEW

- 9556** Cardiovascular disease and COVID-19, a deadly combination: A review about direct and indirect impact of a pandemic
Vidal-Perez R, Brandão M, Pazdernik M, Kresoja KP, Carpenito M, Maeda S, Casado-Arroyo R, Muscoli S, Pöss J, Fontes-Carvalho R, Vazquez-Rodriguez JM
- 9573** Molecular factors, diagnosis and management of gastrointestinal tract neuroendocrine tumors: An update
Pavlidis ET, Pavlidis TE

MINIREVIEWS

- 9588** Human-induced pluripotent stem cell-atrial-specific cardiomyocytes and atrial fibrillation
Leowattana W, Leowattana T, Leowattana P
- 9602** COVID-19 and the cardiovascular system-current knowledge and future perspectives
Chatzis DG, Magounaki K, Pantazopoulos I, Bhaskar SMM

ORIGINAL ARTICLE

Case Control Study

- 9611** PDCA nursing in improving quality management efficacy in endoscopic submucosal dissection
He YH, Wang F

Retrospective Study

- 9619** Impact of COVID-19 pandemic on the ocular surface
Marta A, Marques JH, Almeida D, José D, Sousa P, Barbosa I
- 9628** Anatomy and clinical application of suprascapular nerve to accessory nerve transfer
Wang JW, Zhang WB, Li F, Fang X, Yi ZQ, Xu XL, Peng X, Zhang WG
- 9641** Therapeutic effect of two methods on avulsion fracture of tibial insertion of anterior cruciate ligament
Niu HM, Wang QC, Sun RZ
- 9650** Efficacy of transcatheter arterial chemoembolization using pirarubicin-loaded microspheres combined with lobaplatin for primary liver cancer
Zhang C, Dai YH, Lian SF, Liu L, Zhao T, Wen JY

- 9657** Prognostic significance of sex determining region Y-box 2, E-cadherin, and vimentin in esophageal squamous cell carcinoma

Li C, Ma YQ

- 9670** Clinical characteristics and prognosis of orbital solitary fibrous tumor in patients from a Chinese tertiary eye hospital

Ren MY, Li J, Wu YX, Li RM, Zhang C, Liu LM, Wang JJ, Gao Y

Observational Study

- 9680** Altered heart rate variability and pulse-wave velocity after spinal cord injury

Tsou HK, Shih KC, Lin YC, Li YM, Chen HY

- 9693** Intra and extra pelvic multidisciplinary surgical approach of retroperitoneal sarcoma: Case series report

Song H, Ahn JH, Jung Y, Woo JY, Cha J, Chung YG, Lee KH

META-ANALYSIS

- 9703** Meta-analysis of gemcitabine plus nab-paclitaxel combined with targeted agents in the treatment of metastatic pancreatic cancer

Li ZH, Ma YJ, Jia ZH, Weng YY, Zhang P, Zhu SJ, Wang F

- 9714** Clinical efficacy analysis of mesenchymal stem cell therapy in patients with COVID-19: A systematic review

Cao JX, You J, Wu LH, Luo K, Wang ZX

CASE REPORT

- 9727** Treatment of gastric cancer with dermatomyositis as the initial symptom: Two case reports and review of literature

Sun XF, Gao XD, Shen KT

- 9734** Gallbladder hemorrhage—An uncommon surgical emergency: A case report

Valenti MR, Cavallaro A, Di Vita M, Zanghi A, Longo Trischitta G, Cappellani A

- 9743** Successful treatment of stage IIIB intrahepatic cholangiocarcinoma using neoadjuvant therapy with the PD-1 inhibitor camrelizumab: A case report

Zhu SG, Li HB, Dai TX, Li H, Wang GY

- 9750** Myocarditis as an extraintestinal manifestation of ulcerative colitis: A case report and review of the literature

Wang YY, Shi W, Wang J, Li Y, Tian Z, Jiao Y

- 9760** Endovascular treatment of traumatic renal artery pseudoaneurysm with a Stanford type A intramural haematoma: A case report

Kim Y, Lee JY, Lee JS, Ye JB, Kim SH, Sul YH, Yoon SY, Choi JH, Choi H

- 9768** Histiocytoid giant cellulitis-like Sweet syndrome at the site of sternal aspiration: A case report and review of literature

Zhao DW, Ni J, Sun XL

- 9776** Rare giant corneal keloid presenting 26 years after trauma: A case report
Li S, Lei J, Wang YH, Xu XL, Yang K, Jie Y
- 9783** Efficacy evaluation of True Lift®, a nonsurgical facial ligament retightening injection technique: Two case reports
Huang P, Li CW, Yan YQ
- 9790** Synchronous primary duodenal papillary adenocarcinoma and gallbladder carcinoma: A case report and review of literature
Chen J, Zhu MY, Huang YH, Zhou ZC, Shen YY, Zhou Q, Fei MJ, Kong FC
- 9798** Solitary fibrous tumor of the renal pelvis: A case report
Liu M, Zheng C, Wang J, Wang JX, He L
- 9805** Gastric metastasis presenting as submucosa tumors from renal cell carcinoma: A case report
Chen WG, Shan GD, Zhu HT, Chen LH, Xu GQ
- 9814** Laparoscopic correction of hydronephrosis caused by left paraduodenal hernia in a child with cryptorchism: A case report
Wang X, Wu Y, Guan Y
- 9821** Diagnosed corrected transposition of great arteries after cesarean section: A case report
Ichii N, Kakinuma T, Fujikawa A, Takeda M, Ohta T, Kagimoto M, Kaneko A, Izumi R, Kakinuma K, Saito K, Maeyama A, Yanagida K, Takeshima N, Ohwada M
- 9828** Misdiagnosis of an elevated lesion in the esophagus: A case report
Ma XB, Ma HY, Jia XF, Wen FF, Liu CX
- 9834** Diagnostic features and therapeutic strategies for malignant paraganglioma in a patient: A case report
Gan L, Shen XD, Ren Y, Cui HX, Zhuang ZX
- 9845** Infant with reverse-transcription polymerase chain reaction confirmed COVID-19 and normal chest computed tomography: A case report
Ji GH, Li B, Wu ZC, Wang W, Xiong H
- 9851** Pulmonary hypertension secondary to seronegative rheumatoid arthritis overlapping antisynthetase syndrome: A case report
Huang CY, Lu MJ, Tian JH, Liu DS, Wu CY
- 9859** Monitored anesthesia care for craniotomy in a patient with Eisenmenger syndrome: A case report
Ri HS, Jeon Y
- 9865** Emergency treatment and anesthesia management of internal carotid artery injury during neurosurgery: Four case reports
Wang J, Peng YM

- 9873** Resolution of herpes zoster-induced small bowel pseudo-obstruction by epidural nerve block: A case report
Lin YC, Cui XG, Wu LZ, Zhou DQ, Zhou Q
- 9879** Accidental venous port placement *via* the persistent left superior vena cava: Two case reports
Zhou RN, Ma XB, Wang L, Kang HF
- 9886** Application of digital positioning guide plates for the surgical extraction of multiple impacted supernumerary teeth: A case report and review of literature
Wang Z, Zhao SY, He WS, Yu F, Shi SJ, Xia XL, Luo XX, Xiao YH
- 9897** Iatrogenic aortic dissection during right transradial intervention in a patient with aberrant right subclavian artery: A case report
Ha K, Jang AY, Shin YH, Lee J, Seo J, Lee SI, Kang WC, Suh SY
- 9904** Pneumomediastinum and subcutaneous emphysema secondary to dental extraction: Two case reports
Ye LY, Wang LF, Gao JX
- 9911** Hemorrhagic shock due to submucosal esophageal hematoma along with mallory-weiss syndrome: A case report
Oba J, Usuda D, Tsuge S, Sakurai R, Kawai K, Matsubara S, Tanaka R, Suzuki M, Takano H, Shimoizawa S, Hotchi Y, Usami K, Tokunaga S, Osugi I, Katou R, Ito S, Mishima K, Kondo A, Mizuno K, Takami H, Komatsu T, Nomura T, Sugita M
- 9921** Concurrent severe hepatotoxicity and agranulocytosis induced by *Polygonum multiflorum*: A case report
Shao YL, Ma CM, Wu JM, Guo FC, Zhang SC
- 9929** Transient ischemic attack after mRNA-based COVID-19 vaccination during pregnancy: A case report
Chang CH, Kao SP, Ding DC
- 9936** Drug-induced lung injury caused by acetaminophen in a Japanese woman: A case report
Fujii M, Kenzaka T
- 9945** Familial mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episode syndrome: Three case reports
Yang X, Fu LJ
- 9954** Renal pseudoaneurysm after rigid ureteroscopic lithotripsy: A case report
Li YH, Lin YS, Hsu CY, Ou YC, Tung MC

LETTER TO THE EDITOR

- 9961** Role of traditional Chinese medicine in the initiative practice for health
Li Y, Li SY, Zhong Y
- 9964** Impact of the COVID-19 pandemic on healthcare workers' families
Helou M, El Osta N, Husni R

- 9967** Transition beyond the acute phase of the COVID-19 pandemic: Need to address the long-term health impacts of COVID-19

Tsioutis C, Tofarides A, Spernovasilis N

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The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

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Rare giant corneal keloid presenting 26 years after trauma: A case report

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Abstract

BACKGROUND

Corneal keloid is a rare clinical disease with an unknown etiology, which is easily misdiagnosed. Surgery is the most effective treatment but is rarely reported in the literature. Herein, we report the clinical features, histopathology, and surgical outcome of a giant corneal keloid with trophoblastic vessels and discuss the genesis of the mass.

CASE SUMMARY

A 36-year-old young man was admitted to the hospital because of a large mass on the surface of the left cornea. The patient had suffered an injury to his left eye at the age of 6-years-old; however, as the injury did not cause cornea perforation, he did not undergo treatment. Slit lamp exam showed a large, elevated, opaque lesion that covered the entire cornea and protruded from the surface of the eyeball. Anterior segment optical coherence tomography (AS-OCT) revealed a lesion of irregular density involving the anterior stroma. We suspected a secondary corneal fibroproliferative mass based on the clinical history, and slit lamp and AS-OCT findings. The patient subsequently underwent a superficial keratectomy and keratoplasty, and the final diagnosis of corneal keloid was confirmed by intraoperative histopathological examination.

CONCLUSION

Non-penetrating corneal trauma damages corneal epithelium basement membrane, initiating stromal fibrosis and causing corneal keloids. AS-OCT and biopsy confirm diagnosis.

Key Words: Corneal keloid; Histopathology; Immunohistochemical staining; Anterior segment ocular coherence tomography; Deep anterior lamellar keratoplasty; Case report

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Core Tip: Corneal keloid is a benign proliferation of fibrous or fibrovascular tissue in the corneal stroma, and is rarely encountered in the clinic. The onset of secondary corneal keloids can occur months to years after the surgery or trauma, and the depth of corneal infiltration varies. Histopathology is the gold standard for diagnosis, but the cause of the disease is not yet clear. Here, we report a case of a giant corneal keloid that occurred 26 years after trauma and discuss the cause in detail.

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INTRODUCTION

Corneal keloid is a rare type of ophthalmic disease that presents as a white, painless, enlarged vascular or avascular solitary nodule. It can also involve the entire corneal stroma, with a smooth surface[1]. The diagnosis of corneal keloid can be challenging. It is often referred to as corneal fibroma, myofibroma, and hypertrophic scars, and is easily misdiagnosed as corneal dermatoid tumor, ocular surface squamous neoplasia, and corneal inclusion cyst[2-5]. Corneal keloid can appear primary or secondary to trauma and surgery; secondary keloid, in particular, can occur anytime from months to years after the corneal injury and is commonly treated with surgery[6-8]. Since the morphology and time of onset of corneal keloid are highly variable, biopsy and histopathology are essential for a definitive diagnosis.

Herein, we report the clinical features, histopathology, and anterior segment optical coherence tomography (AS-OCT) features in a case of giant corneal keloid presenting approximately 26 years after corneal trauma.

CASE PRESENTATION

Chief complaints

A 36-year-old man was referred to our hospital in December 2019 to address a corneal swelling found in his left eye 4 years prior. Over the past 2 years, the mass had rapidly increased until it protruded from the surface of the eye, preventing the eyelid from closing properly.

History of present illness

The patient reported having suffered an injury to the left eye at the age of 6-years-old; as the injury had not caused a corneal perforation, treatment was foregone. Since then, however, he had suffered from recurrent redness and a foreign body sensation, which led him to rub his eyes often.

History of past illness

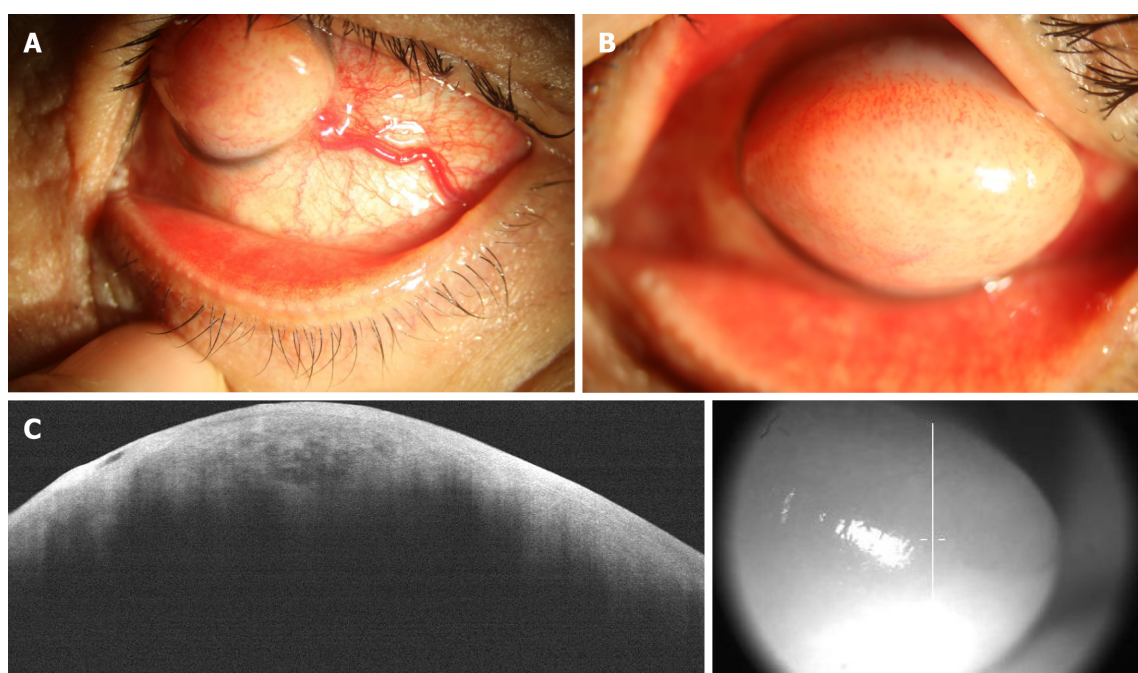
The patient's medical history was unremarkable.

Personal and family history

Not available at this time.

Physical examination

On initial examination, the best-corrected visual acuity (BCVA) was light perception/30 cm for the left eye and 20/20 for the right eye. Slit lamp showed conjunctival congestion with a thick nutrient vessel in the inferior temporal quadrant extending to the corneal limbal epithelium (Figure 1A). A white, tough, round, raised mass, 7 mm high and 9 mm in diameter, with numerous tiny vessels on the surface, localized in the center of the cornea, covered almost the entire cornea surface, preventing the eyelid from closing properly (Figure 1B). Anterior chamber details could not be visualized.



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Figure 1 Preoperative clinical appearance and anterior segment optical coherence tomography images. A and B: Slit lamp microscope images; C: Anterior segment optical coherence tomography images.

Laboratory examinations

Not available at this time.

Imaging examinations

Ultrasonographic evaluation of the posterior segment yielded normal findings. AS-OCT showed irregular epithelial tissue and dense subepithelial tissue with a low density of blood vessel invasion, similar to a honeycomb-like structure (Figure 1C).

FURTHER DIAGNOSTIC WORK-UP

Detailed history-taking of the patient's birth revealed that his mother had a spontaneous full-term delivery and no history of medications taken during pregnancy. No swelling was observed in any parts of the patient's body other than the cornea. The results of routine blood, urine, and immunological examinations were negative.

PRELIMINARY DIAGNOSIS

Secondary corneal fibroproliferative mass.

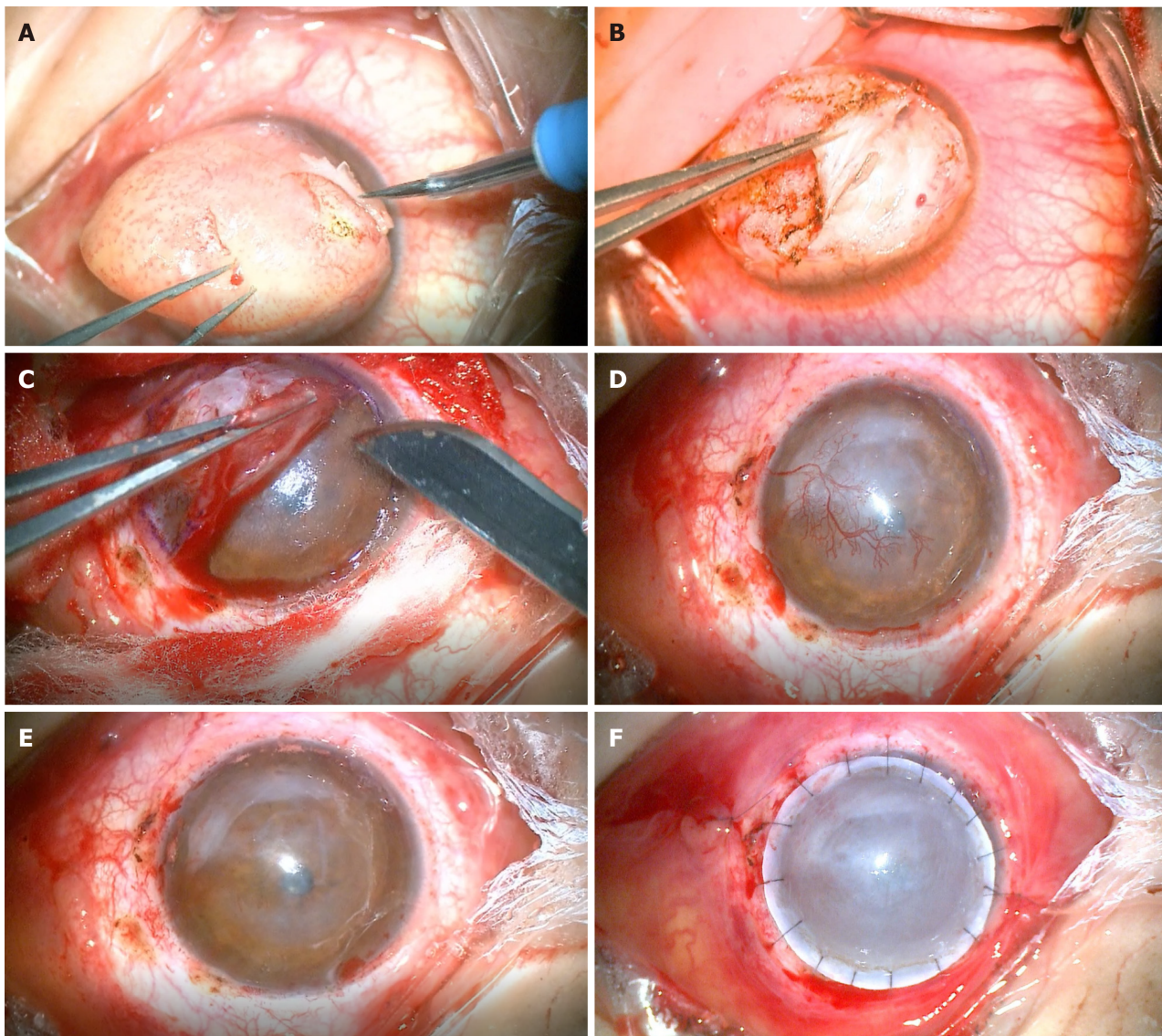
FINAL DIAGNOSIS

Corneal keloid due to pathological examination.

TREATMENT

The lesion was removed *via* superficial keratectomy. Based on the depth of infiltration of the nodule, a deep anterior lamellar keratoplasty was performed (Figure 2). The excised mass was dissected, soaked in formalin, and sent for pathological examination.

Histopathological examination revealed irregular epithelial hyperplasia without Bowman's layer and abundant subepithelial collagen fibers with irregular proliferation and degenerative changes, which



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Figure 2 Surgery procedure. A: Electrocoagulation of the neovascularization on the surface of the swollen tissue; B-C: The hyperplastic fibrous connective tissue was removed, and the corneal stroma was exposed; D: The temporal nutrient vessels were seen in the stroma, with many branches crossing the pupil; E: The corneal stroma was dissected layer-by-layer until the Descemet's membrane was approached, and the corneal endothelium was transparent; F: A 9.25-mm implant and implant bed were made, and the two were aligned and sutured.

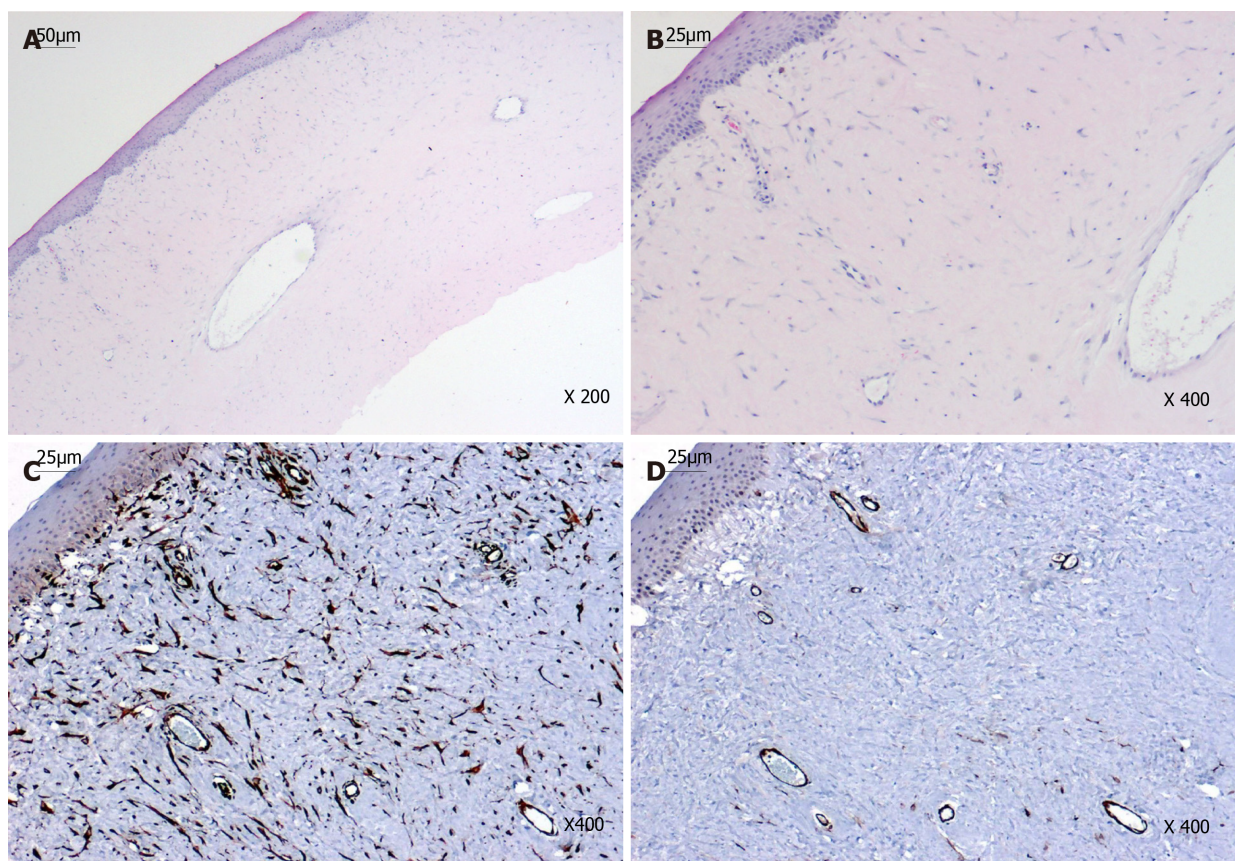
were lined with fibroblasts and vascular cavities (Figures 3A and B). Immunohistochemical staining of the keloid showed diffuse positivity for vimentin and smooth muscle actin (SMA), highlighting the smooth muscle wall of the vasculature and myofibroblasts (Figures 3C and D).

OUTCOME AND FOLLOW-UP

Postoperatively, the patient was prescribed topical steroids, antibiotics, and lubricants. On the first day after surgery, the BCVA was 20/100, and epithelialization of the ocular surface was completed 1 wk later (Figure 4A). There was no recurrence of swelling or post-operative complications during the 4 mo follow-up, and the patient reported satisfaction with the postoperative visual acuity and appearance (Figure 4B). AS-OCT showed that the corneal graft was closely attached to the bed, and the residual stroma thinness was about 100 μm (Figure 4C).

DISCUSSION

Corneal keloid is a rare clinical disease, classified as congenital, primary, or secondary depending on the



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Figure 3 Histopathological and immunohistochemical results. A-B: Hematoxylin and eosin staining showed the irregular surface of the swelling, non-keratinized epithelium without Bowman's layer, and dense fibrous connective tissue with blood vessels beneath the epithelium; C: Vimentin staining was diffusely positive within the parenchyma of the mass; D: Smooth muscle actin staining was positive in the smooth muscle walls of the vasculature and myofibroblasts.

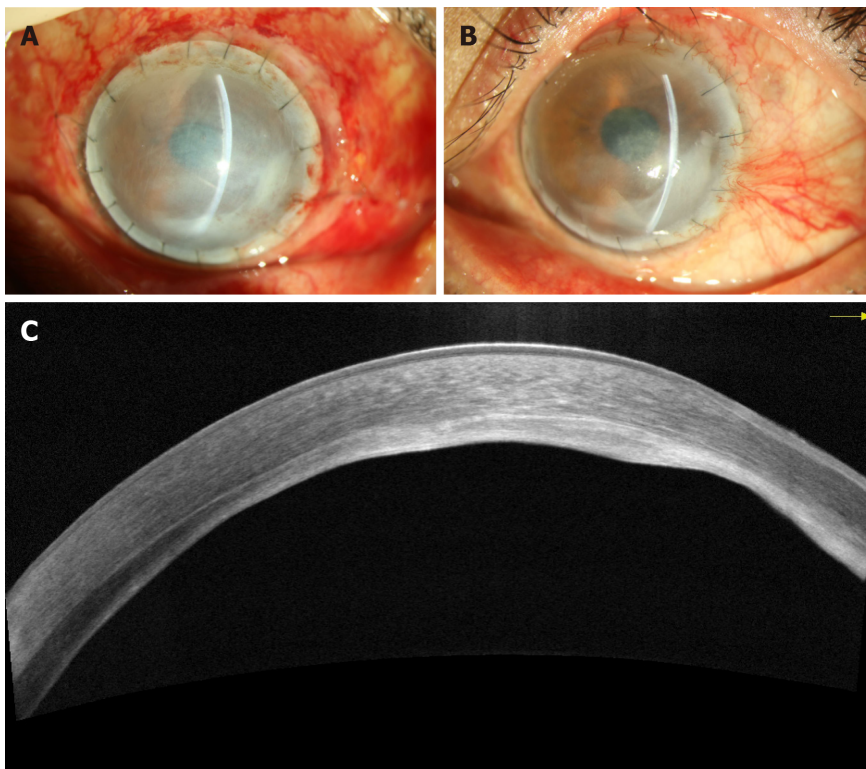
etiology[1]. The earliest case of corneal keloid was reported by Szokalski in 1865[9], and since then approximately 80 cases of corneal keloid have been reported in the literature[2]. Most of the reported cases have occurred secondary to trauma, inflammation, or surgery, and the duration of onset has varied from a few months to several years. Herein, we reported a case of giant corneal keloid presenting approximately 26 years after corneal trauma.

There is no uniformity in the pathogenesis of corneal keloid, according to the collective cases reported. Some scholars believe that keloids result from the replacement of embedded iris and inflammatory exudate by fibrovascular tissue[9]. However, in our case, the patient had no history of penetrating corneal injury, so we believe that the keloid originated from the injury and persistent eye rubbing, which led to excessive corneal repair.

Under normal conditions, an intact corneal epithelial basement membrane (EBM) protects the corneal stroma from the presence of myofibroblasts. Once the EBM is damaged, cytokines such as transforming growth factor beta-1, TGFβ2, and platelet-derived growth factor of corneal epithelial origin enter the stroma layer, contributing to the proliferation and differentiation of myofibroblast precursors[10]. If the EBM is repaired within 1-3 wk, the fibroblast precursors do not mature[11]. We assumed that the EBM could not repair the damage in this patient due to frequent eye rubbing and cytokines that were continuously secreted to stimulate myofibroblast activation. As this persisted for years, secretion of large amounts of extracellular matrix, in turn, led to the formation of a giant corneal keloid. Thus, both vimentin and SMA staining within the keloid were positive.

The enlargement of the swelling also depends on the blood vessel supply. The growth of neovascularization into the cornea is a complex process, in which multiple mediators such as inflammatory regulators, cytokines, growth factors, and matrix metalloproteinases interact. The neovascularization itself can assist dendritic cell (DC) migration into the central area[12]. DCs promote keloid proliferation by secreting a series of cytokines that activate inflammatory pathways in the cornea[13].

After being diagnosed with corneal keloids, 82.6% of patients underwent surgery, these include superficial keratectomy (SK), lamellar excision/keratoplasty, penetrating keratoplasty (PK), sclerokeratoplasty, and enucleation[6,14-16]. SK remains the preferred choice of most physicians, with 70% of patients undergoing the procedure receiving SK. However, according to the literature, a non-dissected mass leads to recurrence in 40% of patients[3]. Bakhtiari performed SK in 1 patient, after which the corneal opacification recurred, so he had to undergo 2 SK procedures combining PK and mitomycin C,



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Figure 4 Postoperative ocular surface and anterior segment optical coherence tomography images. A: Slit lamp image 1 wk after surgery; B: Slit lamp image 4 mo after surgery; C: Anterior segment optical coherence tomography images 4 mo after surgery.

followed by a femtosecond laser-assisted deep anterior lamellar keratoplasty[15]. Therefore, we recommend choosing surgery based on the depth of the infiltrated mass, with the aim of complete removal of the mass from the corneal stroma. For lesions located in the corneal stroma that do not breach the Descemet's membrane, SK combined with amniotic membrane graft or deep lamellar corneal graft may be an option. For lesions that infiltrate into the endothelium or do not reach the endothelium but cause corneal endothelial edema, PK surgery is an option. In our case, the corneal keloid and neovascularization infiltrated the deep stromal layer of the cornea without breaking through the Descemet's membrane; thus, the deep anterior lamellar keratoplasty procedure was selected.

CONCLUSION

Corneal keloids can occur up to 26 years secondary to non-penetrating corneal trauma. The genesis of such keloids may be related to EBM injury with cytokine clustering. AS-OCT plays an important role in early diagnosis of the disease, but confirmation of the diagnosis still relies on histopathological examination. Surgery is the treatment modality of choice for corneal keloid, and the operator should choose the procedure based on depth of infiltration.

FOOTNOTES

Author contributions: Jiang L collected and assembled the patient data; Li S and Wang YH wrote the paper; Jie Y and Yang K operated on the patient; Xu XL performed a biopsy of the tumor; all authors read and approved the final manuscript.

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