



## Cataract surgery in a patient with bilateral necrotising scleritis and peripheral ulcerative keratitis associated with granulomatosis with polyangiitis (Wegener's granulomatosis)

Operacija katarakte kod bolesnika sa obostranim nekrotizujućim skleritisom i perifernim ulceroznim keratitisom u sklopu granulomatoze sa poliangiitisom (Wegener-ova granulomatoza)

Svetlana Stanojlović<sup>\*†</sup>, Selimir Glišić<sup>†</sup>, Snežana Arandjelović<sup>\*‡</sup>,  
Tanja Kalezić<sup>\*†</sup>, Bojana Dačić Krnjaja<sup>\*†</sup>, Borivoje Savić<sup>†</sup>

University of Belgrade, \*Faculty of Medicine, Belgrade, Serbia; Clinical Centre of Serbia,

<sup>†</sup>Clinic for Eye Diseases, <sup>‡</sup>Institute for Allergology and Immunology, Belgrade, Serbia

### Abstract

**Introduction.** We report a rare case of cataract surgery in a patient with an extreme, widespread anterior staphyloma following severe bilateral necrotising anterior scleritis associated with granulomatosis with polyangiitis (GPA). **Case report.** A 61-year-old man with a history of GPA developed bilateral, rapidly progressive necrotising scleritis and peripheral ulcerative keratitis (PUK). Inflammation compromised the entire anterior globe and peripheral cornea in both eyes. More than 90% of the surface area healed within 8 weeks, following the treatment with 3 pulsed doses of methylprednisolone in addition to the cyclophosphamide treatment. Systemic steroid therapy was slowly tapered over a period of 6 months. Extraordinary scleral loss with a uveal bulge developed, following severe necrotising anterior scleritis associated with PUK. Once the full remission had been achieved after 6 months, uncomplicated phacoemulsification was performed in his left eye, the only functional one. **Conclusion.** Preoperative and postoperative control of inflammation, careful surgical planning, and meticulous surgical techniques are critically important for optimal surgical outcome in such patients. To our knowledge, phacoemulsification in a patient with coexisting uveitic cataract and severe anterior staphyloma has not been previously reported.

### Key words:

scleritis; corneal ulcer; granulomatosis with polyangiitis; cataract extraction; treatment outcome.

### Apstrakt

**Uvod.** U radu je prikazan veoma redak slučaj operacije katarakte kod bolesnika sa ekstremnim, opsežnim prednjim stafilomom sklere koji je nastao nakon bilateralnog nekrotizujućeg skleritisa u sklopu granulomatoze sa poliangiitisom (GPA). **Prikaz bolesnika.** Muškarac, starosti od 61 godine, razvio je obostrani, progresivni nekrotizujući skleritis i periferni ulcerozni keratitis (PUK). Inflammacija je obuhvatila celu prednju polovinu bulbusa i periferiju rožnjače na oba oka. Nakon primene 3 pulsne doze metilprednizolona uz povećanje doze održavanja ciklofosfamida, inflamacija je sanirana u više od 90% površine nekrotične sklere u periodu od 8 nedelja. Sistemska steroidna terapija postepeno je redukovana tokom 6 meseci. Kao posledica teškog oblika nekrotizujućeg skleritisa i PUK-a došlo je do ekstremnog istanjenja sklere sa prolabiranjem uvealnog tkiva. Šest meseci nakon potpune remisije bolesti, urađena je nekomplikovana operacija katarakte na levom, jedinom funkcionalnom oku. **Zaključak.** Preoperativna i postoperativna kontrola inflamacije, pažljivo planiranje operacije i izbor hirurške tehnike od kritičnog su značaja za optimalan ishod operacije kod ovakvih bolesnika. Prema našem saznanju, fakoemulzifikacija kod bolesnika sa uveitičnom kataraktom i ekstremnim prednjim stafilomom do sada nije publikovana.

### Ključne reči:

Skleritis; rožnjača, ulceracije; granulomatoza sa poliangiitisom; katarakta, ekstrakcija; lečenje, ishod.

## Introduction

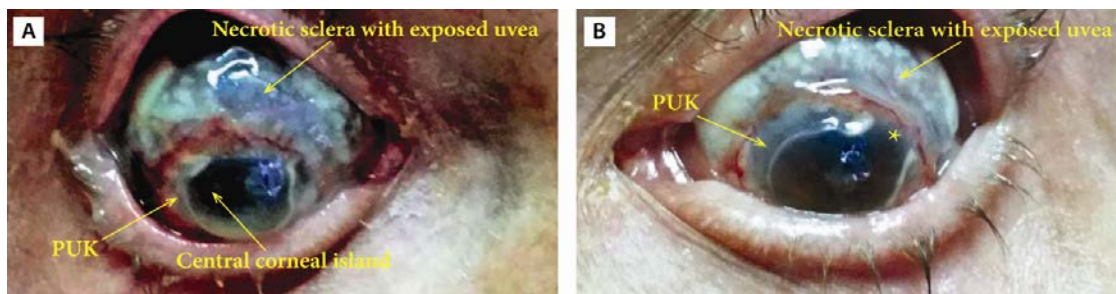
Granulomatosis with polyangiitis (GPA), formerly known as Wegener's granulomatosis, is proteinase-3-ANCA-associated vasculitis with a presumed autoimmune aetiology. Necrotising scleritis is an uncommon inflammatory disorder of the sclera. This severe form of scleritis is almost always extremely painful and can lead to vision-threatening complications and visual loss. The presence of necrotising changes and inflammation of the adjacent cornea is highly suggestive of underlying systemic vasculitis, and GPA is the most common form<sup>1</sup>. Reported here was a rare case of severe necrotising scleritis associated with peripheral ulcerative keratitis (PUK) that simultaneously occurred in both eyes of the patient with GPA. Recently, uncomplicated cataract surgery was reported in a patient with refractory GPA present with scleral thinning; however, this was without any signs of associated inflammation or active necrosis<sup>2</sup>. To our knowledge, the case presented here is the first report of uneventful cataract surgery in a patient with extreme, widespread staphyloma following inflammation that compromised the entire anterior globe and peripheral cornea.

## Case report

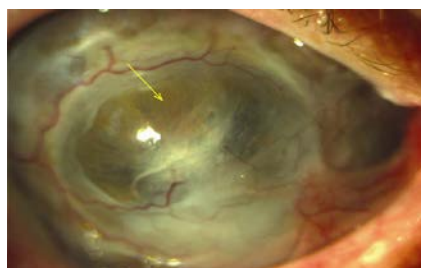
A 61-year-old man with a one-year history of GPA developed bilateral, rapidly progressive necrotising scleritis and PUK. Acute exacerbation of ocular inflammation occurred during the maintenance treatment with oral cyclophosphamide (CYP) (100 mg per day), and 3 months after the induction, a regimen with 6 CYP pulsed was given (1,000 mg per month).

The patient was present with extreme discomfort and visual loss. Upon admission, visual acuity was light perception with projection (L+P+) in the right eye and 20/200 (Snellen) in the left eye. An examination revealed white, thinned avascular areas of the sclera and conjunctiva. The inflamed area involved the entire anterior globe and peripheral cornea of both eyes (Figures 1A and 1B). However, PUK was slightly less severe on his left eye, and a small part of the limbus was uninfamed in the upper temporal quadrant (Figure 1B). A slit-lamp biomicroscopy finding also included anterior chamber inflammation. There were no visible lental opacities in the left eye; however, dense vitreous opacification was observed (vitritis). Fundus examination revealed no clinically significant abnormalities at the posterior pole. Progressive ocular inflammation was associated with a significant increase in serum levels of anti-proteinase-3 (anti-PR3) antibody titre, as well as inflammatory markers. Nonetheless, pulmonary and renal diseases were clinically stable.

More than 90% of the surface area healed within 8 weeks, following the treatment with 3 pulsed doses of methylprednisolone (1,000 mg per day) in addition to oral CYP. Systemic steroid therapy was slowly tapered over a period of 6 months. During this time, the patient's visual acuity further declined to L+P- in the right eye and L+P+ in the left eye. Although inflammation was halted in both eyes, advanced prolonged scleral necrosis associated with PUK led to vision loss in his right eye (no light perception) over a period of 12 months after the disease onset. B-scan ultrasonography of the right eye revealed a large optic disc cup. The flat anterior chamber in this eye (Figure 2) was caused by both extensive posterior synechiae that involved the entire lens surface and



**Fig. 1 – Clinical pictures of the right (A) and left eye (B) showing severe bilateral necrotising scleritis associated with peripheral ulcerative keratitis (PUK). Inflammation affected the entire anterior hemisphere of the sclera and peripheral cornea, leaving a central corneal island uninvolved in both eyes.**



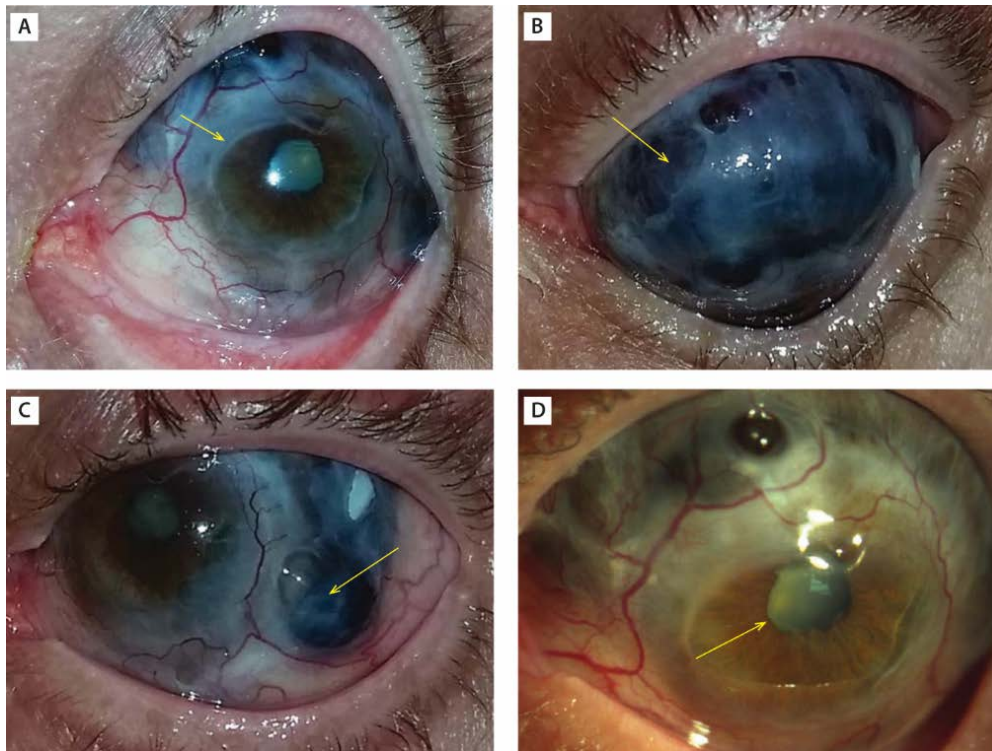
**Fig. 2 – Slit-lamp examination of the patient's right eye showing flat anterior chamber (arrow) associated with corneal scarring following resolution of a severe anterior segment inflammation.**

anterior peripheral ring-shaped iris synechiae. Pupillary block glaucoma and secondary angle closure may coexist in the eye as a consequence of severe anterior segment inflammation with uveitis.

In the left eye, following the resolution of PUK, the area of contiguous scleral necrosis developed into furrow-like corneal thinning with adjacent widespread anterior staphyloma (Figure 3). Corneal guttering extended circumferentially, leaving central corneal tissue unaffected. Mature cataract with extensive posterior iris synechiae precluded fundus examination (Figure 3D). Visual acuity in the left eye was L+P+. B-scan ultrasound showed a relatively smaller optic disc cup in the left eye than in the fellow eye. Intraocular pressure was within the normal range in both eyes (up to 21 mmHg) during the follow-up period of the patient. Active inflammation may suppress ciliary body function, whereas scleral necrosis and consequent scleral thinning may lead to increased aqueous outflow and decreased pressure.

Once the full remission had been achieved after 6 months, cataract surgery was performed in his left eye, the only functional one. A perioperative immunomodulatory drug regimen from Foster et al.<sup>3</sup> was adopted. The drug regimen has been proposed to control inflammation when cataract surgery is performed in uveitic eyes. Oral steroid prophylaxis (0.5 mg/kg/day) was commenced 1 day before the surgery and continued with tapering to the preoperative level over the following month (10 mg/day) while maintaining the dose of concurrent immunosuppressive therapy (CYP, 50 mg per day). In addition, topical dexamethasone 0.1% drops were frequently administered 1 day prior to surgery. Topical steroids were continued with tapering for 2 months postoperatively.

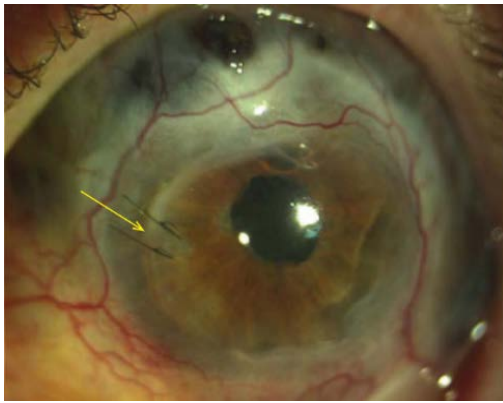
Surgery was performed under topical anaesthesia using the Infiniti Vision Phaco System (Alcon, Inc.). A nearly square clear corneal incision of 2.4 mm width was made at the 10 o'clock meridian with a stainless steel keratome. Corneal incision entry was placed at the inner edge of the peripheral corneal gutter in the nasal eye quadrant



**Fig. 3 – Clinical photograph of the patient’s left eye, examined in daylight, showing the extensive area of anterior staphyloma and an inactive corneal gutter (arrow) following resolution of a severe sclerokeratitis episode (A). Clinical pictures of the upper scleral hemisphere of the left eye (B) and temporal scleral region in the same eye (C). Of note is the extraordinary degree of scleral loss with a uveal bulge (arrows). This uvea is covered by remaining scleral fibres and a thin layer of conjunctival epithelium only (B and C). Slit-lamp examination showing uveitic cataract with extensive posterior synechiae (D).**

corresponding to the area of less severe adjacent anterior staphyloma (Figures 3A and 4). Another 0.6 mm side incision was created in the clear cornea, nearly 90 degrees from the main incision, and the anterior chamber was expanded with a viscoelastic substance comprising sodium hyaluronate 1% (Healon, AMO, Santa Ana, California, USA). Massive posterior iris synechiae were gently loosened

by a conventional iris spatula. Next, an additional viscoelastic substance was injected to achieve adequate mydriasis. Trypan blue was used to enhance the visualization of the anterior lens capsule. Continuous curvilinear capsulorhexis measuring approximately 5.5 mm in diameter was performed with microforceps. After hydrodissection, phacoemulsification of the nucleus was performed



**Fig. 4 – Slit-lamp examination of the patient's left eye one week after uneventful cataract surgery. A clear corneal incision was made in the nasal eye quadrant at the edge of the remaining central corneal island (arrow).**

intorsional mode using a 0.9 mm mini/flared aspiration by-pass system (ABS; Alcon, Inc.) with a 45° Kelman tip with an ultra sleeve on an Infiniti Vision System (Alcon, Inc.). Torsional ultrasound amplitude was set at a maximum of 100% with linear control. Longitudinal phaco was off, and Intelligent Phaco was on. Surgery was performed with low fluidic parameters (aspiration flow rate 25 cc/min, bottle height 60 cm, and vacuum 350 mm Hg). The same parameters were used for direct chopping and quadrant removal. Following unimanual aspiration of the residual cortex, a foldable hydrophilic intraocular lens (IOL) (LEDaphil IOL, Optix) was implanted in the capsular bag with an injector through the main incision. The method for IOL implantation was strictly consistent with product manuals. Additional 10-0 nylon interrupted sutures were placed along the corneal guttering to provide adequate wound closure (Figure 4). Following cataract surgery, visual acuity slightly improved from L+P+ to 20/400 (Snellen). Fundus examination revealed untreatable findings, including a pale, atrophic optic disc and retinal gliosis.

The patient underwent regular clinical, serological, and immunologic examinations for disease activity and extent, as well as for treatment-related side effects. Serum anti-PR3 antibody titres and inflammatory markers were within the normal range before cataract surgery and during the 1-year follow-up period after the cataract surgery. Two years after the initial presentation and one year following the cataract surgery, the patient remained in remission with an uncorrected visual acuity of 20/400. The mechanisms contributing to vision loss in the right eye and restricted vision in his left eye most likely included vascular occlusion and inflammatory destruction of the retina and optic nerve, as well as retinal findings related to the underlying GPA disease associated with prolonged inflammation, loss of structural tissue and secondary glaucoma.

## Discussion

The management of GPA-associated PUK is challenging and lacks definitive guidelines. Rituximab and CYP, either alone or combined with other agents, are the most successful agents in controlling inflammation <sup>1</sup>.

In our patient, the introduction of high-dose pulsed methylprednisolone, in addition to maintenance doses of prednisone and increased oral CYP treatment, arrested the bilateral necrotising scleritis and PUK with generalized GPA associated with ophthalmic inflammation refractory to CYP induction regimen.

The presence of long-standing anterior uveitis associated with severe scleral tissue necrosis, as well as chronic corticosteroid usage, may lead to the formation of a cataract. Uneventful cataract extraction or any other surgical procedure can precipitate necrotising scleritis in patients with an underlying autoimmune vasculitic systemic disease <sup>4, 5</sup>. Therefore, surgery should be attempted only in the absence of scleral inflammation and during remission of systemic disease.

Although the diagnostic value of a positive PR-3 ANCA (c-ANCA) for GPA is well established, the usefulness of measuring ANCA titres in assessing disease activity and guiding therapy is somewhat controversial. In one study of 20 patients with refractory ophthalmic GPA, disease relapse seemed to be predicted by rising anti-PR3 titres <sup>6</sup>. However, this finding was not confirmed in another similar study on ocular GPA <sup>7</sup>. Nevertheless, since increases in ANCA occur in some patients prior to relapse, serial measurement of the c-ANCA titre was performed in our patient. Serum anti-PR3 antibody titres were within the normal range before cataract surgery and during the follow-up period after cataract surgery, which lasted 12 months.

Successful surgery generally requires a quiet eye devoid of active inflammation for at least 3 months <sup>1</sup>. In our patient, phacoemulsification was performed 6 months after the full remission of ocular disease activity had been achieved. Preoperative addition or increase in systemic therapy, mainly corticosteroids, seems to be mandatory in eyes at risk of developing disease recurrences, such as necrotising scleritis or PUK. In a study by O'Donoghue <sup>8</sup>, patients who had recovered from SINS and required further ocular surgical procedures were given perioperative pulsed methylprednisolone for protection against the recurrence of the necrotising disease. It was demonstrated here that standard perioperative oral steroid prophylaxis, which is currently proposed to control inflammation for cataract surgery in uveitic eyes, was also sufficient to prevent SINS.

Phacoemulsification using a clear corneal approach is generally preferred in patients in remission from PUK <sup>1</sup>. O'Donoghue et al. <sup>8</sup> showed that surgically induced necrotising scleritis usually occurred after cataract surgery and that the disease site was closely related to the wound site; 80% of these sites were limbal. This finding suggests that greater relative vascular disruption associated with the limbal approach may be a contributing factor in scleral disease development <sup>8</sup>. Dick et al. <sup>9</sup> also demonstrated that compared to surgery through a sclerocorneal incision, cataract extraction through a clear corneal incision results in reduced inflammation in the immediate postoperative period. Generally, a clear corneal

incision is made temporally. Here, a clear corneal incision was rotated to the nasal eye quadrant. In this area, the adjacent anterior staphyloma was slightly less severe than the extreme scleral thinning in both superior and temporal eye quadrants (Figures 3B and 3C). A corneal incision was made on the corneal guttering; thus, single corneal sutures with 10-0 nylon were required to ensure adequate wound closure (Figure 4). Interestingly, although necrotising scleritis after ocular surgery has been described in patients after a cataract surgery via a corneal incision, O'Donoghue et al.<sup>8</sup> found that sutures used to close the wound had entered the sclera.

## Conclusion

Phacoemulsification can be successfully performed in a patient with coexisting uveitic cataract and staphyloma of the entire anterior globe following necrotising scleritis with PUK. Preoperative and postoperative control of inflammation, careful surgical planning, and meticulous surgical techniques are critically important for optimal surgical outcomes. The final visual outcome depends on the posterior segment complications of necrotising scleritis associated with GPA.

## R E F E R E N C E S

1. *Ebrahimiadib N, Modjtahedi BS, Roohipoor R, Anesi SD, Foster CS.* Successful treatment strategies in granulomatosis with polyangiitis-associated peripheral ulcerative keratitis. *Cornea* 2016; 35(11): 1459–65.
2. *Aljawaq AM.* Successful cataract surgery in a patient with refractory Wegener's granulomatosis effectively treated with rituximab: A case report. *Saudi J Ophthalmol* 2016; 30(3): 194–7.
3. *Foster CS, Kothari S, Anesi SD, Vitale AT, Chu D, Metzinger JL,* et al. The Ocular Immunology and Uveitis Foundation preferred practice patterns of uveitis management. *Surv Ophthalmol* 2016; 61(1): 1–17.
4. *Solebo AL, Ahmadi-Lari S, Petron P, Westcott M.* Bilateral surgically induced scleritis following phacoemulsification. *J Cataract Refract Surg* 2007; 33(8): 1485–7.
5. *Stokes J, Wright M, Ramaesh K, Smith C, Dhillon B.* Necrotizing scleritis after intraocular surgery associated with the use of polyester nonabsorbable sutures. *J Cataract Refract Surg* 2003; 29(9): 1827–30.
6. *Joshi L, Lightman SL, Salama AD, Shirodkar AL, Pusey CD, Taylor SR.* Rituximab in refractory ophthalmic Wegener's granulomatosis: PR3 titers may predict relapse, but repeat treatment can be effective. *Ophthalmology* 2011; 118(12): 2498–503.
7. *Joshi L, Tanna A, McAdoo SP, Medjeral-Thomas N, Taylor SR, Sandhu G,* et al. Long-term outcomes of rituximab therapy in ocular granulomatosis with polyangiitis: Impact on localized and nonlocalized disease. *Ophthalmology* 2015; 122(6): 1262–8.
8. *O'Donoghue E, Lightman S, Tuft S, Watson P.* Surgically induced necrotising sclerokeratitis (SINS)-precipitating factors and response to treatment. *Br J Ophthalmol* 1992; 76(1): 17–21.
9. *Dick HB, Schwenn O, Krummenauer F, Krist R, Pfeiffer N.* Inflammation after sclerocorneal versus clear corneal tunnel phacoemulsification. *Ophthalmology* 2000; 107(2): 241–7.
10. *Vasavada AR, Praveen MR, Vasavada VA, Raj SM, Asnani PK, Garg VS.* Impact of high and low aspiration parameters on postoperative outcomes of phacoemulsification: randomized clinical trial. *J Cataract Refract Surg* 2010; 36(4): 588–93.
11. *Vasavada V, Raj SM, Praveen MR, Vasavada AR, Henderson BA, Asnani PK.* Real-time dynamic intraocular pressure fluctuations during microcoaxial phacoemulsification using different aspiration flow rates and their impact on early postoperative outcomes: a randomized clinical trial. *J Refract Surg* 2014; 30(8): 534–40.

Received on October 29, 2018.

Revised on January 12, 2019.

Accepted on January 23, 2019.

Online First January, 2019.