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**DOI** 10.1055/a-1785-4912

Klin Monatsbl Augenheilkd 2022; 239: 559–564

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ISSN 0023-2165

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# Valsalva-Induced Spontaneous Suprachoroidal Hemorrhage: A Case Report and Review of the Literature

## Valsalva-induzierte spontane suprachoroidale Blutung: ein Fallbericht und Literaturüberblick

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### Key words

suprachoroidal hemorrhage, spontaneous, Valsalva maneuver

### Schlüsselwörter

Valsalva-Manöver, suprachoroidale Blutung, Spontanblutung

received 26.9.2021

accepted 27.2.2022

### Bibliography

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DOI 10.1055/a-1785-4912

ISSN 0023-2165

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### ABSTRACT

We report a rare case of spontaneous suprachoroidal hemorrhage and present a systematic review of the literature using PubMed/Medline databases. Patients that developed a spontaneous suprachoroidal hemorrhage with a history of previous intraocular surgery were excluded. An 82-year-old male patient with no known ocular pathologies or surgical history was referred with acute ocular pain and decreased vision in the right eye (BCVA: 0.6 with hyperopic correction) following a Valsalva maneuver. General history included chronic heart failure and coronary artery disease, treated with anticoagulant and antihypertensive drugs. Dilated fundus examination

revealed a posterior red-brown choroidal mass, with a thickness of 1.5 mm on B-scan ultrasonography. The lesion was not visible on fluorescein or indocyanine green angiography and was located under the choroid on B-scan optical coherence tomography. The diagnosis of a spontaneous suprachoroidal hemorrhage was evoked, and the patient was observed. Five months later, BCVA was 1.0 uncorrected, with a normal-appearing fundus. In a literature review, eight cases of spontaneous suprachoroidal hemorrhage following an episode of increased intrathoracic pressure were identified, including our patient. M/F ratio was 1:1, with a median age of 66.5 years. All cases presented systemic pathologies. All cases presented with a unilateral suprachoroidal hemorrhage. Only 2/8 patients had ocular comorbidities. Complications requiring treatment were noted in 4/8 cases, including 2 cases that resulted in the loss of the vision following an acute angle-closure glaucoma. Spontaneous resolution of the hemorrhage was observed in the other 4 patients. In 6/8 cases, vision recovered over a mean period of 10 weeks. In conclusion, spontaneous suprachoroidal hemorrhage following a Valsalva maneuver in eyes with no history of ocular surgery or trauma is rare, and has been associated with advanced age, cardiovascular disease and asthma. In severe cases (2/8) the eye was lost, while most cases (6/8) recovered, presenting a good visual outcome.

### ZUSAMMENFASSUNG

Wir berichten über einen seltenen Fall einer spontanen suprachoroidalen Blutung und präsentieren eine systematische Überprüfung der Literatur anhand der Datenbanken PubMed/Medline. Patienten, die eine spontane suprachoroidale Blutung mit einer Vorgeschichte von intraokularen Operationen entwickelten, wurden ausgeschlossen. Ein 82-jähriger männlicher Patient ohne bekannte okuläre Pathologien oder chirurgische Vorgeschichte wurde mit akuten Augenschmerzen und vermindertem Sehvermögen auf dem rechten Auge (BCVA: 0,6 mit Hyperopiekorrektur) nach einem Valsalva-Manöver überwiesen. In der Anamnese wurden eine chronische Herzinsuffizienz und eine koronare Herzkrankheit angegeben, die mit blutgerinnungshemmenden und blutdruck-

senkenden Medikamenten behandelt wurden. Bei der Untersuchung des erweiterten Augenhintergrunds zeigte sich im B-Scan-Ultraschall eine rot-braune Aderhautmasse mit einer Dicke von 1,5 mm im hinteren Bereich. Die Läsion war weder in der Fluoreszenz- noch in der Indocyaningrünangiografie sichtbar und befand sich in der optischen B-Scan-Kohärenztomografie unter der Aderhaut. Die Diagnose einer spontanen suprachoroidalen Blutung wurde gestellt, und der Patient wurde beobachtet. Fünf Monate später betrug der BCVA unkorrigiert 1,0, und der Augenhintergrund sah normal aus. In einer Literaturübersicht wurden 8 Fälle von spontanen suprachoroidalen Blutungen nach einer Episode erhöhten intrathorakalen Drucks identifiziert, darunter unser Patient. Das Geschlechterverhältnis war 1:1, das Durchschnittsalter betrug 66,5 Jahre. Alle Fälle wiesen systemische Pathologien auf. Alle Fälle wiesen eine einseitige suprachoroidale Blutung auf. Nur

2/8 Patienten hatten okuläre Komorbiditäten. Behandlungsbedürftige Komplikationen traten in 4/8 Fällen auf, darunter 2 Fälle, die zum Verlust des Sehvermögens infolge eines akuten Winkelverschlussglaukoms führten. Bei den anderen 4 Patienten wurde ein spontanes Abklingen der Blutung beobachtet. In 6/8 Fällen erholte sich das Sehvermögen über einen durchschnittlichen Zeitraum von 10 Wochen. Zusammenfassend lässt sich sagen, dass eine spontane suprachoroidale Blutung nach einem Valsalva-Manöver bei Augen ohne chirurgische Eingriffe oder Trauma in der Vorgeschichte selten ist und mit fortgeschrittenem Alter, kardiovaskulären Erkrankungen und Asthma in Verbindung gebracht wird. In schweren Fällen (2/8) kam es zum Verlust des Auges, während sich die meisten Fälle (6/8) erholten und ein gutes Sehergebnis zeigten.

## Introduction

Suprachoroidal hemorrhage (SCH) is a rare condition with a potentially dramatic visual prognosis, caused by a ciliary artery rupture [1]. It has been mostly described as a complication during ocular surgery in relation to a fluctuating intraocular pressure, which can turn into an expulsive hemorrhage [1]. To a lesser extent, it can occur in the immediate postoperative period, or following ocular trauma [1, 2]. “Spontaneous” SCH (SSCH) has been reported only sporadically, following a Valsalva maneuver, which is defined as a transient episode of increased intrathoracic pressure due to forceful expiration against closed airways.

While surgically related SCH is known to be linked with systemic risk factors such as advanced age, cardiovascular disease (CVD), including arterial hypertension, atherosclerosis, and coagulation disorders, as well as diabetes and asthma [1], their association with SSCH has only been identified recently. Ocular conditions such as age-related macular degeneration (AMD), glaucoma, and pseudophakia also seem to be correlated with SSCH [3–5]. However, the few literature reviews on “spontaneous” SCH do not clearly indicate if or when a previous intraocular surgery took place [3, 4]. Also, the literature describes a poor visual outcome following an episode of SSCH [3, 4].

In contrast, we report a patient, with no ocular history, who had an SSCH after a Valsalva maneuver with a good visual recovery despite his cardiovascular comorbidities. We then review comparable cases in the literature, excluding all cases with any history of ocular surgery or trauma.

## Methods

Case report and systematic review of PubMed/Medline databases, using the search words suprachoroidal hemorrhage, spontaneous, and Valsalva. Clinical findings, risk factors, management, and final outcomes were identified and compared. Patients with a history of previous intraocular surgery and/or ocular trauma were excluded.

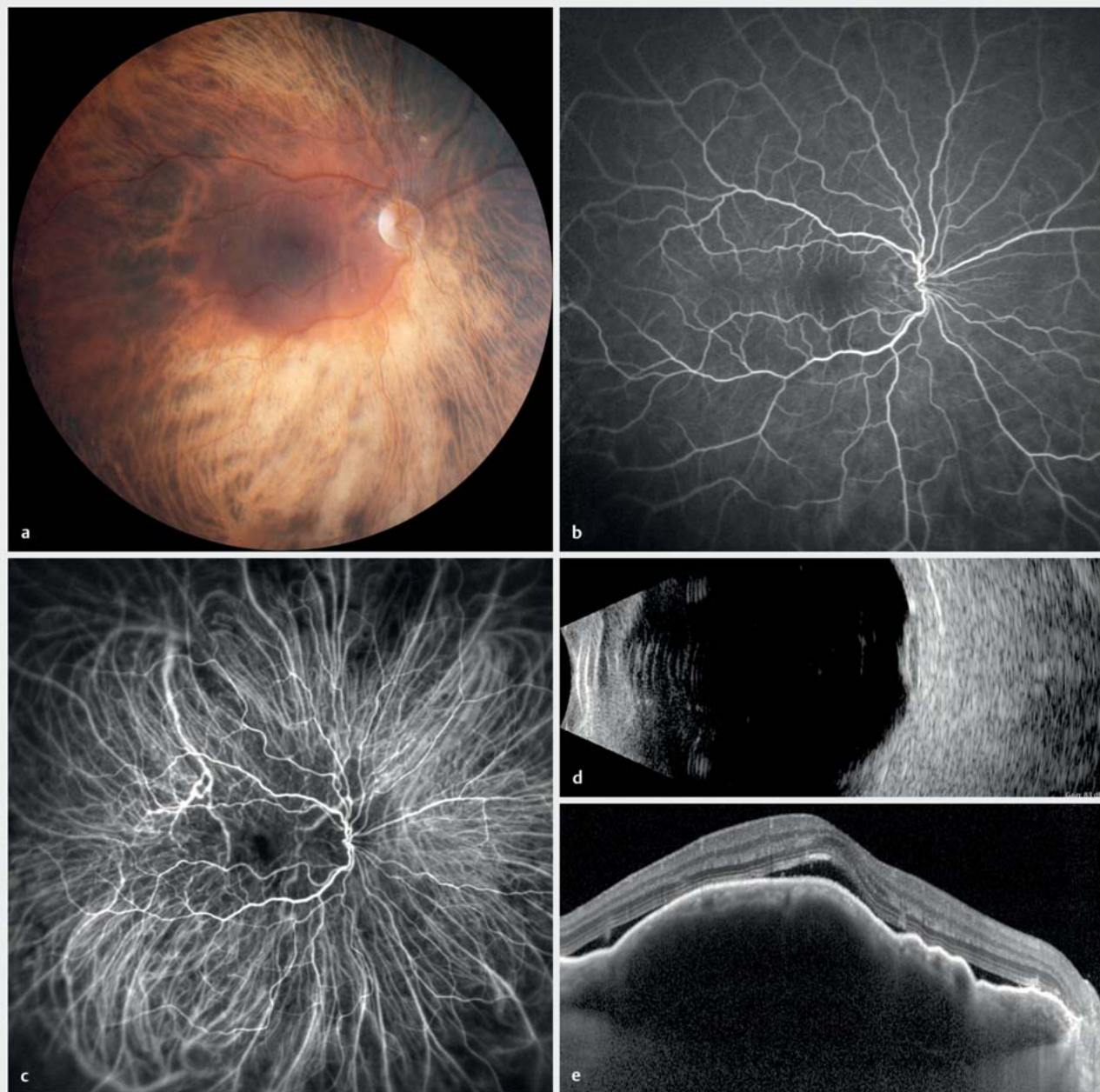
## Report of a Case

An 82-year-old male patient was referred with acute ocular pain and decreased vision in the right eye immediately following a Valsalva maneuver during forced defecation, one day earlier. Ophthalmic history was unremarkable, with a best-corrected visual acuity (BCVA) of 1.0 uncorrected bilaterally, which was documented during a routine eye checkup 1 year prior. Systemic history included chronic heart failure due to high blood pressure, and coronary artery disease treated with a stent and an anticoagulant drug (apixaban). Eight years earlier, the patient had undergone surgery and chemotherapy due to a sigmoid adenocarcinoma, in remission.

Upon examination, VA was 0.08 unaided and could be improved to 0.63 (+ 4.25, – 1.50 at 90°) in the right eye, and 1.0 unaided in the left eye. Intraocular pressure was 14 and 10 mmHg, respectively. Both anterior segments were normal. Right fundus examination revealed a posterior red-brown choroidal mass, with an axial thickness of 1.5 mm on 20 MHz B-scan ultrasonography (VuMAX HD, Sonomed Escalon, Escalon Medical Corp., Wayne, Pennsylvania, USA). The choroidal mass was not visible on fluorescein or indocyanine green (ICG) angiography (Spectralis; Heidelberg Engineering, Heidelberg, Germany). On B-scan optical coherence tomography (OCT) (Spectralis; Heidelberg Engineering, Heidelberg, Germany), the lesion was located under the choroid, presenting a “lumpy-bumpy” surface, evocative of the irregular surface classically described in choroidal metastasis; a thin layer of subretinal fluid was observed (► Fig. 1). The contralateral fundus was unremarkable. A diagnosis of SSCH was made, and the patient was observed. After 5 months’ follow-up, the patient had completely recovered, with a BCVA of 1.0 unaided, and a fully resolved fundus lesion.

## Review of the Literature

Six articles matching our criteria were identified, representing eight patients that developed SSCH following an episode of Valsal-



► **Fig. 1** a Panoramic color fundus picture (Panoret-1000, Medibell, Medical Vision Technologies LTD., Haifa, Israel): posterior red-brown choroidal mass (RE). b, c Panoramic fluorescein (b) and ICG (c) angiography (HRA 150°, using the Staurengli lens, Spectralis; Heidelberg Engineering, Heidelberg, Germany): normal at 1 min. d Posterior lesion of 1.5 mm thickness on 20 MHz B-scan ultrasonography (VuMAX HD, Sonomed Escalon, Escalon Medical Corp., Wayne, Pennsylvania, USA). e Suprachoroidal “lumpy-bumpy” lesion on B-scan OCT (EDI, Spectralis; Heidelberg Engineering, Heidelberg, Germany).

va maneuver, including our case [4, 6–10] (► **Table 1**). Median age was 66.5 years with a male/female ratio (M/F) of 1 : 1.

All patients had underlying systemic pathologies: 6/8 patients had CVD, such as systemic hypertension (HTN: 4), coronary artery disease (CAD: 1), heart failure (HF: 1), aortic valve disease (1), aortic aneurysm (1), cerebrovascular accident (CVA: 1), or disseminated intravascular coagulation (DIC: 1), and 2/8 suffered from asthma. The youngest patient, apart from CVD, also had chronic

renal failure (CRF: 1). Six patients (6/8) were reported to take systemic medication prior to presentation, including antihypertensive drugs (antiHTN: 2/8), antithrombotic or anticoagulant drugs (3/8), antiasthma drugs (1/8), and indoramin (an alpha-blocker used for prostatic hyperplasia: 1/8).

All cases presented with a strictly unilateral SSCH (RE/LE ratio: 5/3). The localization of the hemorrhage was either limited to the posterior pole (1/8), to the periphery (3/8), or spread diffusely

► **Table 1** Clinical characteristics of patients in the literature presenting with a Valsalva-induced SSCH and no history of intraocular surgery.

	Age (yrs)	Sex	Systemic comorbidities	Systemic treatments	Side	Location of suprachoroidal hemorrhage	Ocular comorbidities	Complications	Management	Initial BCVA	Final BCVA	Recovery time (weeks)
This case	82	M	CVD (HTN, CAD, HF)	AntiHTN, Apixaban	RE	Posterior	None	None	Observation	0,63	1,0	20
Castro Flórez et al. (2021) [6]	70	F	CVD (HTN)	AntiHTN	RE	Posterior & Periphery	None	None	Observation	0,4	1,0	12
Marous et al. (2018) [7]	54	F	Asthma	Antiasthma	RE	Periphery	None	None	Observation	1,0	1,0	8
Marous et al. (2018) [7]	68	F	CVD (aortic valve disease)	Warfarin	LE	Periphery	Glaucoma	None	Observation	1,0	1,0	8
Hsiao et al. (2016) [4]	64	M	CVD (HTN, CVA)	Clopidogrel	RE	Diffuse	Extracapsular scarring	AACG, Phthisis	Sclerotomy	NLP	NLP	NA
Lim et al. (2011) [10]	75	F	CVD (aortic aneurysm, DIC)	None	LE	Diffuse	None	AACG, recurrent SSCH, intraocular pain	Enucleation	HM	NLP	NA
Tajika et al. (2008) [9]	32	M	CVD (HTN), CRF	NA	LE	Posterior & Periphery	None	Elevated IOP, RD, subretinal & vitreous hemorrhage	Vitreotomy, pan-retinal photocoagulation	0,01	0,8	12
Hammam et al. (2003) [8]	65	M	Asthma	Indoramin	RE	Periphery	None	Elevated IOP	Intravenous acetazolamide	0,25	1,2	1
	<b>Median: 66,5</b>	<b>M/F: 1/1</b>			<b>RE/LE: 5/3</b>							<b>Mean: 10</b>

Abbreviations: yrs: years; M: male; F: female; CVD: cardiovascular disease; HTN: hypertension; CAD: coronary artery disease; HF: heart failure; CVA: cerebrovascular accident; DIC: disseminated intravascular coagulation; CRF: chronic renal failure; antiHTN: antihypertensive drugs; NA: not available; RE: right eye; LE: left eye; AACG: acute angle-closure glaucoma; SSCH: spontaneous suprachoroidal hemorrhage; IOP: intraocular pressure; RD: retinal detachment; BCVA: best-corrected visual acuity; NLP: no light perception; HM: hand motion

(4/8). Ocular comorbidities, such as “glaucoma” and “extrafoveal scarring”, were reported in two patients.

Complications were described in 4/8 cases, all presenting with increased intraocular pressure at the time of diagnosis. One patient underwent enucleation 3 months later due to a recurrent SSCH with acute angle-closure glaucoma (AACG) and uncontrolable pain [10]. One case developed phthisis bulbi following AACG with a diffuse SCH, which was treated with a sclerotomy [4]. One case presented with a hemorrhagic retinal detachment and subsequently required a vitrectomy due to the vitreous hemorrhage leaving residual vitreous opacities [9]. And finally, one patient received intravenous acetazolamide to decrease the intraocular pressure with no additional surgery [8]. Spontaneous resolution of the hemorrhage, without any further intervention, was observed in the other four patients (4/8).

Final outcome for 2/8 cases who had a BCVA of hand motion (HM) or worse at presentation and suffered major complications resulted in the loss of vision (2/2) and even the globe (1/2). In the other 6/8 cases, visual outcome was favorable with a resolution of the hemorrhage over a mean period of 10 weeks and a final BCVA of at least 0.8.

## Discussion

Spontaneous suprachoroidal hemorrhage represents a rare disease that frequently leads to a severe visual impairment or blindness. In this article, we describe a patient with a Valsalva-induced SSCH and a spontaneously favorable evolution. While reviewing the literature, we identified 8 similar SSCH cases including ours, with a positive outcome in 6/8 cases.

Previous studies regarding “SSCH” concluded that the final vision was generally poor [3–5]. Therefore, we looked at the risk factors influencing prognosis. Overall, age-related, systemic, and ocular pathologies seem to play a key role in the pathogenesis of SCH whether it occurs in a surgical setting, postoperatively, or in a spontaneous fashion. CVD, which was present in most of the patients described in this review (including our patient), leads to choroidal arteriolar sclerosis and fragility [1]. It is worth noting that asthma is related to a higher CVD event rate [11]. Furthermore, this susceptibility to arteriolar rupture would be increased by ocular conditions that additionally weaken the integrity of choroidal vessels. Those conditions include glaucoma, myopia, aphakia or pseudophakia, choroiditis, recent intraocular surgery, and SCH in the contralateral eye [1], as well as AMD [3–5]. Therefore, the fact that only two cases in our review had ocular comorbidities, while they were well represented in most reports [3,4], might explain in part the different prognosis.

In addition, the main difference between the characteristics of the patients in this SSCH review and those of prior series lies in the surgical status of the eye. While we excluded all cases with any history of intraocular surgery, most reviews on SSCH do not clearly define whether intraocular surgery had been performed in the past, nor the time interval between an intervention and the development of SSCH. For example, Chai et al. excluded cases that happened in the per- or immediate postoperative period, but included eyes with previous, “distant” intraocular surgery [3]. “Delayed” SCH was identified by Reibaldi et al. as SCH that developed

within 48 hours after pars plana vitrectomy [12], while Ghadhfan et al. included patients up to 2 months after pediatric surgery [13]. Surgical manipulation provokes stress to the posterior ciliary arteries, with an increased fragility of the choroidal vasculature [14], which might not entirely disappear over time. If arterial damage already exists or further develops due to, e.g., advanced age, this could lead to a spontaneous hemorrhage [15]. We therefore hypothesize that any surgical intervention, regardless of the time of its occurrence, could negatively influence the onset of SSCH following a Valsalva maneuver and its outcome.

Another important factor linked with a worse prognosis is the development of complications following the SSCH. In four of the eight patients mentioned in this article, an elevated intraocular pressure was noticed, including two eyes that presented with an AACG that ultimately led to visual loss. Chai et al. reported that about 70% of cases presented acute secondary glaucoma [3]. The mechanism of AACG in SCH is thought to be caused by an anterior iris-lens displacement [10, 16, 17].

In conclusion, Valsalva-induced SSCH is a rare event. It is associated with age-related conditions, such as cardiovascular disease, and asthma. Without a history of any previous intraocular surgery or trauma, and in the absence of acute angle-closure glaucoma, most cases present a favorable visual outcome.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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