Terson's Syndrome—Rate and Surgical Approach in Patients with Subarachnoid Hemorrhage

A Prospective Interdisciplinary Study

Christos Skevas, MD,[1,*] *Patrick Czorlich, MD,*[2,*] *Volker Knospe, MD,*[1] *Birthe Stemplewitz, MD,*[1] *Gisbert Richard, MD,*[1] *Manfred Westphal, MD,*[2] *Jan Regelsberger, MD,*[2] *Lars Wagenfeld, MD*[1]

Objectives: To analyze the need for surgical intervention in Terson's syndrome (TS) and the rate of TS, as well as the effect of pars plana vitrectomy (PPV) with or without internal limiting membrane (ILM) peeling, complications, correlations between TS and sex, and the influence of the severity of subarachnoid hemorrhage (SAH) expressed by Glasgow Coma Scale (GCS) score and Hunt and Hess grade on the occurrence of TS.

Design: Prospective, uncontrolled, interdisciplinary study.

Participants: A total of 102 patients with SAH over a period of 24 months.

Methods: Patients were examined on days 1 and 14. A PPV was indicated in cases of nonresorbing vitreous hemorrhage (VH). Peeling of the ILM was performed with the help of ILM-BLUE (DORC, Zuidland, The Netherlands) using end-gripping ILM forceps.

Main Outcome Measures: Effect of PPV on visual acuity (VA) and timing of intervention in cases of nonresorbing VH.

Results: The rate of TS was 19.6% (20/102). The mean age of the patients was 52.1±11.8 years. Patients presenting with an initial GCS of less than 8 or with high Hunt and Hess grades were more affected by TS. Eight (9 eyes) of the 20 patients with TS (40% of the patients with TS) underwent a PPV for nonclearing vitreous bleeding. In 4 patients (4 eyes; 20% of patients with TS), ILM peeling was considered necessary because of sub-ILM bleeding. The mean interval between SAH and PPV was 4.4 months (range, 3–5 months). Postoperative follow-up was 6.4 months. Visual acuity improved in all patients. Best-corrected VAs at first and at last presentations were 2.2 and 0.0625 logarithm of the minimum angle of resolution (logMAR), respectively. For patients who underwent ILM peeling, these values were 1.725 and 0.05 logMAR, respectively.

Conclusion: Pars plana vitrectomy and ILM peeling have beneficial effects on the visual rehabilitation of patients with nonclearing VH after TS. We did not identify any safety concerns after PPV in our patients with dense nonclearing hemorrhage that persisted for more than 3 months. *Ophthalmology 2014;■:1–6 © 2014 by the American Academy of Ophthalmology.*

Although Terson's syndrome (TS) was first described by Litten in 1881,[1] it was subsequently named after the French ophthalmologist Albert Terson in 1900.[1] Today, TS is commonly defined as the occurrence of an intraocular hemorrhage associated with a subarachnoid hemorrhage (SAH).[1,2] Clinically, intraocular hemorrhage may be subretinal, intraretinal, preretinal, subhyaloid, or intravitreal, and, at present, any type of intracranial hemorrhage accompanied by vitreous or retinal hemorrhage is known as TS.[3,4] According to the literature, TS also may be caused by intracerebral hemorrhage, subdural or epidural hematoma, severe brain injury, or intraventricular hemorrhage.[5] The mechanism causing intraocular bleeding remains unclear, but the prevailing hypothesis is that TS is the result of retinal venous hypertension caused by displaced blood that is forced into the liquor spaces of the optic nerve and causes obstruction of the central retinal vein and choroidal anastomosis[6–8] under high intracranial pressure.

A broad variation in the rate of TS, between 10.5% and 46%, can be found in the literature. This can be attributed to the fact that the definition of TS has shifted in clinical practice from being solely a vitreous hemorrhage (VH) to including any type of VH or retinal hemorrhage (vitreous, intraretinal, preretinal, subhyaloidal);[3,4] VH is found in 3% to 5% of cases.[9–13] There is an association among intraocular hemorrhage, the severity of intracranial hemorrhage, and the mortality rate. Patients with higher Hunt and Hess grades exhibit a higher frequency of intraocular bleeding and mortality rate.

Currently, there are no clear guidelines for the timing of ophthalmological interventions.[9,14,15] Spontaneous clearance of VH may be expected within 10 to 12 months, but vitreous surgery can expedite this process, especially in cases of nonclearing hemorrhage. This may prevent some of the severe complications, including epiretinal membrane formation, macular holes, proliferative vitreoretinopathy (PVR),

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retinal detachment, hemosiderosis, optic atrophy, and development of amblyopia in younger patients.[10,11,16–18] Proliferation of glial cells and elements of the retinal pigment epithelium are capable of causing retinal distortion and fibrotic adhesion.[18]

The aim of our interdisciplinary study was to analyze the need for surgical intervention in TS, the effect of vitrectomy with or without internal limiting membrane (ILM) peeling, the appearance of complications (intraoperative or postoperative), the rate of TS, the correlations between TS and sex, and the influence of severity of SAH expressed by Glasgow Coma Scale (GCS) score and Hunt and Hess grade on the occurrence of TS. All of our patients were hospitalized for SAH.

Methods

This uncontrolled interdisciplinary prospective study was approved by the local ethics committee of the medical council of the state of Hamburg (PV3611 and PV4079). All patients with SAH admitted to our hospital over a period of 24 months were screened for TS if written consent was signed by the patient or legal representative. In total, 102 patients were included in this study. Ophthalmological examination (OE) was performed on days 1 and 14, including best-corrected visual acuity (BCVA); in patients sufficiently responsive to following standardized OE, anterior chamber evaluation and fundoscopy (assessment of optic nerve head, macula, and peripheral retina) were performed after medical mydriasis (Mydriaticum Stulln) and pupillary reaction. The examination on day 14 was performed to detect TS developing after a delay of several days, which has been described elsewhere. In cases of VH in which retinal examination was not possible, B-scan ultrasonography was performed. All patients with TS were asked to come back to the ophthalmology department for a follow-up visit after 3 months or as soon as they were discharged from the rehabilitation centers.

In cases of nonresorbing VH lasting at least 3 months (mean interval between SAH and vitrectomy was 4.4 months; range, 3–5 months), a standard 23-gauge 3-port pars plana vitrectomy (PPV) was performed (9 eyes of 8 patients) using an Accurus system (Alcon, Fort Worth, TX). If sub-ILM deposits of blood or puckering of the ILM was observed during surgery (after clearing the dense VH), an additional peeling of the ILM was performed (4 cases). The ILM was stained with the help of ILM-BLUE (DORC, Zuidland, The Netherlands) and peeled with end-gripping ILM forceps. All patients underwent a complete OE preoperatively and postoperatively and optical coherence tomography (OCT) examination (Cirrus OCT; Carl Zeiss Meditec, Dublin, CA) postoperatively to evaluate the effect of the vitrectomy and the ILM peeling.

Statistics

Statistical analyses of the data were performed using a Student *t* test, chi-square test, or trend tests (Mantel–Haenszel chi-square), depending on the scale of the measurements, to examine correlations between the parameters using SPSS Statistics 21 (IBM, Chicago, IL). For statistics, visual acuity (VA) values were transformed to a logarithm of the minimum angle of resolution (logMAR) scale and compared using a Student *t* test. The level of statistical significance was set at $P<0.05$. For figures, the VA scores were used on a decimal scale for better visualization.

Results

The rate of TS was 19.6% (20/102) with a predominance among female patients (16/66 female patients, 4/36 male patients; $P = 0.113$). The mean age of the patients was 52.1±11.8 years (range, 23–87 years). Patients presenting initially with a GCS score of less than 8 (chi-square = 13.328; $df = 1$; $P = 0.001$), a high Hunt and Hess grade (chi-square = 23.622; $df = 1$; $P<0.001$), and a high Fisher grade (chi-square = 9.389; $df = 1$; $P = 0.002$) were more often effected by TS. As a consequence of the lower initial GCS score, the higher Hunt and Hess grade, and higher Fisher grade, patients with TS had a statistically significantly worse Glasgow Outcome Scale score after 3 months (chi-square = 12.706; $df = 1$; $P = 0.001$) (Table 1).

Table 1. Characteristics of Patients with Subarachnoid Hemorrhage (Aneurysmal and Perimesencephalic Subarachnoid Hemorrhage)

Characteristic	No. of Patients	
	No TS	*With TS*
Sex		
Male	32	4
	88.9%	11.1%
Female	50	16
	75.8%	24.2%
GCS score at admission		
≥8	73	11
	86.9%	13.1%
<8	9	9
	50.0%	50.0%
Hunt and Hess grade		
I	34	2
	94.4%	5.6%
II	24	2
	92.3%	7.7%
III	13	5
	72.2%	27.8%
IV	10	4
	71.4%	28.6%
V	1	7
	12.5%	87.5%
Fisher grade at admission		
1	6	0
	100%	0%
2	13	0
	100%	0%
3	20	2
	90.9%	9.1%
4	40	18
	69.0%	31.0%
GOS after 3 mos		
1	0	1
	0%	100%
2	5	4
	55.6%	44.4%
3	9	5
	64.3%	35.7%
4	18	5
	78.3%	21.7%
5	50	5
	90.9%	9.1%

GCS = Glasgow Coma Scale; GOS = Glasgow Outcome Scale; TS = Terson's syndrome.