

ORIGINAL ARTICLE

Posner-Schlossman Syndrome (Glaucomatocyclitic Crisis) A 5-Year Review

Emma Rusmayani¹

¹Jakarta Eye Center, March, Jakarta, Indonesia

E-mail: emma.rusmayan@gmail.com

ABSTRACT

Background: Posner-Schlossman syndrome (PSS) or glaucomatocyclitic crisis is a rare condition with self-limited unilateral recurrent episodes of elevated intraocular pressure (IOP) and mild anterior chamber inflammation in which diagnosis can be challenging. We reviewed our 5-year experience with PSS to give a brief picture of the natural characteristic of the disease.

Methods: We investigated 56 eyes from 52 patients (24 males and 28 females; both eyes for 2 males and 2 females) diagnosed with PSS during the years 2012-2017 in the Jakarta Eye Center Menteng and Kedoya. Data were collected on age, gender, visual acuity, episode of attacks, drugs regimen, IOP during attacks and after surgery or treatment in the latest follow up.

Results: The mean age of the 52 patients was 48.13 years-old (range, 18–82 years). The mean intraocular pressure (IOP) of initial record for all 56 eyes was 37.63 mmHg (ranged from 10-65 mmHg). The mean visual acuity during attacks was 0.87 LogMAR and mean episode of attacks was 2.41 times, with 41% of the cases were their first time onset. Medical treatment was efficacious for 39 patients (69.62 %). Eight patients (14.82 %) underwent a surgical treatment and all had normal IOP afterwards.

Conclusions: PSS was found more in middle-aged patients. PSS tend to be the typical self-limiting and response well to medical treatment. However, the episodic and recurrent nature of PSS should be a concern. Therefore, patients with PSS must have regular evaluation of visual acuity, visual fields and IOP.

Keywords: Posner-Schlossman syndrome (PSS); intraocular pressure (IOP); visual field defects

Posner-Schlossman syndrome (PSS) or glaucomatocyclitic crisis is a rare condition with self-limited unilateral recurrent episodes of markedly elevated intraocular pressure (IOP) and mild idiopathic anterior chamber inflammation.¹ It is classified as an inflammatory glaucoma because it is by definition always accompanied by uveitis.² The underlying cause of PSS is unknown. Several factors such as viral infection, autoimmune, autonomic dysregulation, vascular endothelial dysfunction, and allergic conditions have been proposed as possible contributors to the development of this disease.^{3,4}

Its hallmark is a rise in IOP that is out of proportion to the degree of inflammation. This acute elevation of IOP accompanied by or followed within a few days by a mild, often symptomless uveal inflammation.⁵ Minimal discomfort despite marked and acute elevation of pressure lead to an under-detection of the disease.⁶

Typically, the first symptoms are slight ocular discomfort, blurred vision and seeing colored haloes around nights, characteristically affecting only one eye. Posner and Schlossman identified a unilateral condition of recurrent mild cyclitis, lasting for a few hours to several

weeks, associated with slight decrease in vision, elevated IOP with open angles, corneal edema with a few keratic precipitates (KP) with fine appearance, heterochromia with anisocoria, and a large pupil in the affected eye.⁷ PSS tends to affect patients between 20 and 50 years of age.⁸ Usually peripheral anterior synechiae are not present in this disease.⁴ The condition spontaneously resolves in days to weeks but anti-glaucoma and anti-inflammatory treatment is indicated to reduce IOP and inflammation.² Some patients may have atypical presentation, in that they have an elevated IOP between attacks, optic nerve head cupping and field loss in the affected as well as the non-affected eye, progressing to open angle glaucoma.⁴

Diagnosis of PSS is inherently difficult. The subtlety of some features of the low-grade uveitis and the short-lived nature of each attack make it hard to diagnose.⁹ PSS should be differentiated from acute Angle Closure Glaucoma (ACG), Primary Open Angle Glaucoma (POAG), uveitic glaucoma and Fuchs Heterochromic Iridocyclitis (FHI).

PSS maybe misdiagnosed as acute Angle Closure Glaucoma (ACG) and chronic ACG. Gonioscopy reveals open angles in PSS compared to the partially or completely closed angles in angle closure glaucoma. The absence of acute ocular symptoms (severe pain, nausea, vomiting, and corneal edema) raise some doubt regarding the diagnosis of ACG.³ One of the differential diagnoses is POAG. Some studies have shown an association of primary open-angle glaucoma and PSS.^{4,10} POAG is commonly seen in older age group patients. On the other hand, PSS typically affects patients between second and fourth decades.¹¹ Typical PSS is rarely bilateral, self-limited, subsiding in days to weeks and rarely persisting beyond a few weeks.^{2,10}

PSS may also mimic Fuchs Heterochromic Iridocyclitis (FHI). The diagnosis of PSS can be confirmed via the response to treatment as FHI tends to be

unresponsive to steroid therapy. Furthermore, the definition of FHI includes the development of cataracts, which is not a typical feature of PSS.² FHI also can be ruled out due to absence of heterochromia and stellate KP.¹¹

PSS and uveitic glaucoma have some common features. Both conditions show signs of anterior uveitis, elevated IOP, and respond to topical steroids. The key features to differentiate PSS from uveitic glaucoma include the mild iridocyclitis, lack of posterior synechiae or peripheral anterior synechiae, and that the rise in IOP is typically out of proportion to the inflammatory process.⁵

Treatment of PSS is aimed at controlling intraocular pressure and decreasing inflammation. The favored initial treatment is a combined regimen of an anti-inflammatory and anti-glaucoma drug.¹¹ Topical beta-blocker such as Timolol, alpha-agonists such as Brimonidine, Apraclonidine and carbonic anhydrase inhibitors such as Dorzolamide and oral Acetazolamide can be used as first line agents.^{12,13} Topical corticosteroids such as prednisolone acetate 1% four times a day, followed by rapid taper, is usually successful in controlling the inflammation.^{3,14}

PSS has been considered as a “benign” disease, marked with elevated intraocular pressure, anterior chamber widely open, absence of ciliary or conjunctival injection, and only trace of aqueous flare without posterior synechiae. The etiology of PSS has not been determined but several factors other than viral infections has been proposed to as possible contributors to the development of the disease such as: autoimmune, autonomic dysregulation, allergic conditions, and vascular endothelial dysfunction.¹⁵

Most patients are treated for attacks and recover without long-term complications or sequelae but a proportion of patients with repeated attacks, even after treatment, showed long term glaucomatous changes in the optic nerve and/or on visual field tests. In a study of

53 cases of PSS, 14 (26.4%) were found to have glaucomatous optic nerve damage.¹⁴ Trabeculectomy may be considered, if IOP cannot be controlled with maximum medical therapy or signs of glaucomatous optic nerve damage and visual field defects appear.¹⁶

PSS is typically similar to a variety of ocular disorders in which diagnosis can be challenging. Appropriate medical care for patients presenting with PSS includes a thorough history-taking, a comprehensive eye examination, a careful explanation of the disorder to the patient, and a commitment for a long term follow-up care of the patient.¹⁷ In this study, we reviewed our 5-year experience with PSS to give a brief picture of the natural characteristic of the disease.

METHODS

We investigated 56 eyes from 52 patients (24 males and 28 females; both eyes for 2 males and 2 females) with a diagnosis of PSS at Jakarta Eye Center Menteng and Kedoya between 2012 and 2017. The clinical presentations of patients were analyzed, including demographic data, intraocular pressure (IOP), visual acuity, inflammation of anterior chamber, and funduscopy. This study using clinical data including visual acuity testing, IOP measurement and perimetry was approved by the ethical clearance from Jakarta Eye Center.

Data were collected on age, gender, visual acuity (in logMAR), episode of attacks, drugs regimen, IOP during attacks and after surgery or treatment in the latest follow up. The IOP was measured by Goldmann applanation tonometry. All the patients receive topical corticosteroid as the part of the treatment, but different amount and regimen of anti-glaucoma drugs. Patient whose eyes had uncontrolled IOP with maximum medical treatment or progressive visual-field loss, underwent surgical treatment. Data analysis was performed using the SPSS 20.0 statistical software.

Patients were advised to continue anti-glaucoma medication and topical steroids were tapered over a period of month. Follow-up included observations of conjunctiva injection, corneal edema, KPs, aqueous cells and flare, iris, pupil, and gonioscopy results. The optic discs were evaluated with use of a slit lamp on a dilated fundus examination. An optic disc was considered abnormal with localized optic disc notching, rim thinning or retinal nerve fiber layer defect. Visual-field examination involved use of automated computerized perimetry.

RESULTS

Table 1. The descriptive summary of patient with PSS by age and gender

Age (year)	Male		Female		Total	
	No	%	No	%	No	%
<20	0	0.00	1	3.33	1	1.78
20-29	2	7.70	1	3.33	3	5.36
30-39	4	15.38	8	26.67	12	21.43
40-49	6	23.08	8	26.67	14	25.00
50-59	7	26.92	7	23.33	14	25.00
60-69	3	11.54	4	13.34	7	12.25
≥ 70	4	15.38	1	3.33	5	8.93
Total	26	100.00	30	100.00	56	100.00

Table 2. Peak Intraocular Pressure (IOP) during PSS attacks of 56 eyes.

Age (year)	Male		Female		Total	
	No	%	No	%	No	%
<20	4	15.38	3	10.00	7	12.50
21-30	4	15.38	3	10.00	7	12.50
31-40	8	30.78	8	26.67	16	28.57
41-50	5	19.23	12	40.00	17	30.36
51-60	4	15.38	3	10.00	7	12.50
≥ 60	1	3.65	1	3.33	2	3.57
Total	26	100.00	30	100.00	56	100.00

Total 56 eyes (23 right eyes, 33 left eyes) were enrolled in this study, and the mean age was 48.13 years-old (range, 18–82 years). Majority of these patients were 30-59 years old (71.43%). A considerable population older than 60 years (21.43%) was also observed. Patients younger than 20 years old accounted for 1.78 %. In this study, the gender composition was almost

similar with a little bit majority of female patients (24 males and 28 females). There were two males and two females were diagnosed with PSS for both eyes. A brief summary of patients' age and gender can be seen in Table 1.

The mean intraocular pressure (IOP) of initial record for all 56 eyes diagnose with PSS was 37.63 mmHg (ranged from 10-65 mmHg). There were 49 eyes (87.50 %) had a presenting IOP that was greater than 20 mmHg, 75.00 % eyes had an presenting IOP that was greater than 30 mmHg, 46.43 % eyes had an presenting IOP that was greater than 40 mmHg, and 16.07% eyes had an presenting IOP that was greater than 50 mmHg. The IOP during attacks is in Table 2. which the majority IOPs during PSS attacks were higher than 30 mmHg, especially between 41 and 50 mmHg.

During the attacks, we checked the patients' visual acuity. Most of them experience mild-moderate vision disturbance. The mean visual acuity was 0.87 LogMAR (ranged from 0.20 – 1.60 LogMAR). One patient only detect the movement of hand waves so she scores 2.50 LogMAR.

All the patients' eyes receive drug treatment between a combined regimen of topical corticosteroids and anti-glaucoma drugs in eye drops or oral preparation. The IOP for 39 eyes (69.62 %) returned to normal with resolution of the inflammation after medical treatment. There were eight eyes (14.28 %) undergoing a surgery treatment after receiving drug therapy. One patient underwent selective laser trabeculoplasty (SLT) to reduce the pressure in the eye, two patients were implanted by Ahmed glaucoma valve (AGV) as an aqueous shunt, and the rest of them underwent trabeculectomy with Mitomycin C (MMC) for the healing modulation. Surgical treatment was decided because the IOP remained high on maximum medical therapy or visual field defect has appeared.

From Table 3. below, there was no difference between PSS cases that gave a

good response to drugs treatment without any visual defects and PSS cases that unresponsive to maximum drugs treatment that needed a surgical therapy due to emergence of visual defects based on the age ($p = 0.895$), IOP ($p = 0.242$), episodes ($p = 0.734$), and visual acuity during attack ($p = 0.839$).

Table 3. The difference between two groups of PSS related to drugs treatment

Parameters	PSS responsive to drugs treatment (without visual defect)	PSS unresponsive to maximum drugs treatment (with visual defects)	P value
Number (%)	43 (76.78)	8 (14.28)	
Age	49.60 ± 14.67	48.88 ± 12.24	0.895
IOP	39.56 ± 11.58	34.12 ± 13.69	0.242
Episodes	2.51 ± 1.91	2.75 ± 0.89	0.734
Visual Acuity	0.89 ± 0.35	0.86 ± 0.37	0.839

*five patients lost to follow up

The mean episode of attacks was 2.41 times (range, 1-9 times) with 41% of the cases were their first time onset. In this study, not all patients had come back to control their condition. We couldn't measure the latest IOP of five patients' eye after the treatment due to lost to follow up. The mean period of follow-up was 25.49 months (range, 1 – 67 months).

DISCUSSION

The purpose of this study is to describe our clinical experience with PSS in terms of the natural characteristic of the disease. Our 52 patients (56 eyes) were, on average, middle-aged (48.13 years; ranged from 18–82 years). There had a high incidence between 30-59 years of age. These findings were similar to Jiang et al. retrospective review study in China. Jiang reported that PSS was prone to affect

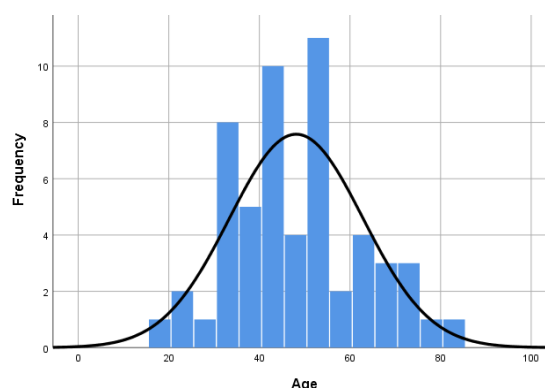
young adults and middle-aged patients between 20-60 years old. PSS in individuals older than 60 years as well as in adolescence is considered as a rare condition, but these population were not exempted.⁶ Although we could not exclude the possibility that some of these older patients may have already been affected with PSS for several years before their first clinical visit, an older age involvement should gain more attention.

Our present study found that PSS is slightly higher in females than that in males. On the contrary, Jiang et al. in their study showed a higher incidence of PSS in males than females.⁶ Gender predilection in PSS has not been clearly described. The distribution in middle-aged, male patients of this disease may be related with the endocrine, hormone or immune status. Further research for underlying mechanisms are still needed.

The key feature of PSS is the recurrent episodes of self-limited, mild, non-granulomatous anterior uveitis with markedly elevated IOP.⁵ The mean initial IOP record for all 56 eyes with PSS in this study was 37.63 mmHg (range, 10-65 mmHg). Of our 52 patients (56 eyes), medical treatment was helpful for 43 eyes (76.78 %) and efficacious for 69.62 % (39 eyes). Four patient still had IOP above > 21 mmHg even after 9 months receiving combined drugs therapy but do not feel any visual field disturbances. They had already received 1-3 regimen of eye drops and two oral anti-glaucoma drugs for each patient. This four patients do not show a significant response to drugs treatment but still show a decline of IOP and reduction in the inflammation afterwards. The mean IOP record on the latest follow up showed an average 14.63 mmHg (with five patient lost to follow up). Topical beta blockers and/or carbonic anhydrase inhibitors are the drugs of choice in patients with PSS. Efficacy of prostaglandin analogs in PSS is not well established.³ Although the prognosis of most PSS is usually benign, the IOP and optic nerve disc must be monitored.

Eight eyes (14.28 %) from 6 female and 2 male patients, exhibited a condition that need surgical treatment. Almost all of these surgical cases exhibited at least two documented PSS attacks, except one patient. Their IOP were not under control with maximum medical therapy and patients started to develop visual field defects. There were two patients with moderate visual field defect (MD -5.00 - 12.00) underwent trabeculectomy. The rest of surgical cases had normal visual field or early glaucoma based on Humphrey testing. Trabeculectomy with anti-metabolite treatment, SLT and implantation of AGV resulted in normal IOP from the latest measurement of the last follow-up. A study by Zhong et al. described 8 eyes that underwent trabeculectomy, had no attacks in the 30-month follow-up.¹⁸ The latest report from Ng et al., also suggested that trabeculectomy may control the IOP and prevent future recurrences.¹⁹ In this study, we could not find the relationship between the age, IOP, episode of attacks, decrease on visual acuity and unresponsive PSS to drugs treatment that cause visual defects or glaucomatous damage.

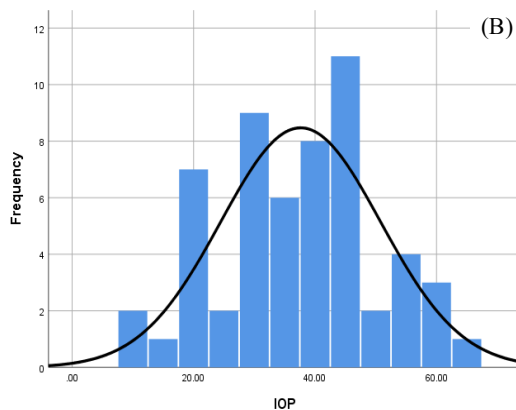
Figure 1. The Histogram Chart of PSS patients based on (A) Age; (B) IOP



Episodic elevation of IOP is due to impairment of outflow facility secondary to inflammatory changes in the trabecular meshwork. Elevation in IOP is postulated to be secondary to inflammation of the trabecular meshwork, which may be mediated by prostaglandins.²⁰ Prostaglandins, particularly prostaglandin

E, have been found in higher concentration in the aqueous humor of patients during acute attacks, but not in between PSS episodes.²¹ Moreover, a direct correlation between levels of prostaglandins in the aqueous humor and the level of IOP has been reported during acute attacks of glaucomatocyclitic crisis.³ IOP reduction in glaucoma patients can be achieved with medical, laser, or surgical therapy. The exact etiology and pathophysiology are still not fully understood, which makes it difficult to prevent the recurrence.

Visual-field damage can occur with long-term disease. patients PSS is usually unilateral, but bilateral cases have been reported. Among our 56 eyes, bilateral disease was seen in four patients, and both eyes of every case had an average raising of IOP during attacks. Previous reports described binocularly involved cases with a higher prevalence of visual damage than monocularly involved cases.²² In our follow up, four patients with both eyes diagnosed with PSS gave a good response to combination of local and systemic drug treatment.



Mild discomfort and blurred vision are the first common symptoms of PSS. It is important to check the visual acuity of the patients. 56 eyes gave a variative result score of visual acuity ranged from 0.2 – 2.5 logMAR. During the acute phase of PSS, optic nerve head configuration and retinal blood flow rates are temporarily altered.³ Following resolution of the acute attack, these changes are reversed without any permanent damage. Jap et al. in their retrospective review of 50 patients (53

eyes) with PSS, found glaucoma in 14 eyes (26.4%) as a result of repeated PSS attacks.¹⁴ It's important to explain the patient about the disease and ask for a regular follow up to check for any glaucomatous changes. As clinicians, we should suspect CMV in patients who have mild unilateral anterior inflammation, with recurrences of elevated IOP, and perform an aqueous humor tap for PCR analysis, to detect any virus DNA, since long-lasting PSS could cause glaucomatous changes. A prompt diagnosis and appropriate treatment is required in PSS patients to improve their prognosis.

CONCLUSIONS

As in this study, PSS can present a challenging diagnosis at first presentation with intraocular pressure that is disproportionate to the mild inflammatory signs and symptoms. PSS was found more in middle-aged patients. PSS tends to be the typical self-limiting and response well to medical treatment. The cases with uncontrolled IOP and visual field defects were intervened with surgical treatment, complied with good outcome. The episodic and recurrent nature of PSS requires a close monitoring. Therefore, patients with PSS must have regular evaluation of visual acuity, visual fields and IOP.

FOOTNOTE

Conflicts of Interest : The authors have no conflicts of interest to declare.

Ethical Statement : The study was approved by the Research Ethics Committee of Jakarta Eye Center Menteng and Kedoya

REFERENCES

1. Narang SK, Shah SJ. Glaucomatocyclitic crisis (Posner-Schlossman syndrome) case report. *Indian J Ophthalmol* 1972;20:25-27.

2. Moorthy RS, Mermoud A, Baerveldt G, Minckler DS, Lee PP, Rao NA. Glaucoma associated with uveitis. *Surv Ophthalmol* 1997; 41: 361–394.
3. Shazly TA, Aljajeh M, Latina MA. Posner-Schlossman Glaucomatocyclitic Crisis. *Ophthalmology* 2011; 26(4-5): 282–284
4. Raitta C, Vannas A. Glaucomatocyclitic crisis. *Arch Ophthalmol* 1977; 95: 608–612.
5. Posner A, Schlossman A. Syndrome of unilateral recurrent attacks of glaucoma with cyclitic symptoms. *Arch Ophthalmol.* 1948; 39:517.
6. Jiang JH, Zhang SD, Dai ML, Yang YJ, Xie YQ, Hu C, Liang YB. Posner-Schlossman Syndrome in Wenzhou, China: a retrospective review study. *British Journal of Ophthalmology* 2017. DOI: 10.1136/bjophthalmol-2016-309863
7. Posner A, Schlossman A. Further observations on the syndrome of glaucomatocyclitic crisis. *Trans Am Acad Ophthalmol Otolaryngol.* 1953; 57: 531.
8. Harrington J. Posner-Schlossman syndrome: a case report. *J Am Optom Assoc* 1999; 70: 715–723.
9. Green RJ. Posner-Schlossman syndrome (glaucomatocyclitic crisis). *Clin Exp Optom.* 2007 Jan; 90(1): 53–56.
10. Kass MA, Becker B, Kolker AE. Glaucomatocyclitic crisis and primary open angle glaucoma. *Am J Ophthalmol* 1973; 75: 668–673.
11. Arvind Rathod. Posner Schlossman Syndrome - A Case Report. *MRIMS J Health Sciences* 2016; 4(3): 177-178
12. Muthusamy P. Apraclonidine in the management of glaucomatocyclitic crisis. *Eye.* 1994; 8(Pt3):367-368.
13. Hong C, Song KY. Effect of apraclonidine hydrochloride on the attack of Posner Schlossman syndrome. *Korean Journal of Ophthalmol.* 1993 Jun; 7(1): 28-33.
14. Jap A, Sivakumar M, Chee SP. Is Posner Schlossman syndrome benign?. *Ophthalmology* 2001;108(5): 913-918.
15. Murata K, Ishida K, Ozawa K, et al. The characteristics of Posner-Schlossman syndrome : A comparison in the surgical outcome between cytomegalovirus-positive and cytomegalovirus-negative patients. *Medicine* 2019; 98 : 48-56.
16. Hung PT, Chang JM. Treatment of glaucomatocyclitic crises. *American Journal of Ophthalmology* 1974; 77: 169-172.
17. Oakman J. "Posner-Schlossman Syndrome." *eMedicine.* 2010, June 2018; downloaded from <http://emedicine.medscape.com/article/1205949-overview>.
18. Zhong Y, Cheng Y, Liu X, et al.. Trabeculectomy in the management of glaucomatocyclitic crisis with visual field defect. *Ocul Immunol Inflamm* 2010;18:233-236.
19. Wang L, Yin G, Wang D, Yu Z. Posner-Schlossman syndrome: a 10-year review of clinical experience. *Ann Eye Sci* 2017; 2: 51.
20. Masuda K, Izawa Y, Mishima S. Prostaglandins and glaucomatocyclitic crisis. *Jpn J Ophthalmol.* 1975; 19: 368
21. Neufeld AH, Sears ML. Prostaglandin and eye. *Prostaglandins.* Aug 1973; 4(2): 157–75
22. Puri P, Verma D. Bilateral glaucomatocyclitic crisis in a patient with Holmes Adie Syndrome. *J Postgrad Med* 1998; 44: 76-77