

Ocular ischemic syndrome associated with primary hyperparathyroidism**Abstract**

Aims To present a case of bilateral ocular ischemic syndrome presenting at the carotid artery obstruction and discuss possible etiological factors, including parathyroid adenoma.

Presentation of Case We report an unusual a rare case of bilateral ocular ischemic syndrome, secondary to internal carotid artery atherosclerosis incurred as part of primary hyperparathyroidism.

Discussion A significant decrease in visual acuity can sometimes be the initial sign of PH and being well-acquainted with calcium homeostasis of the eye could help diagnose this condition.

Conclusion To our knowledge, this is the first report of bilateral ocular ischemic syndrome associated with primary hyperparathyroidism.

Keywords: Ocular Ischemic Syndrome, swelling optic nerve head, Visual loss, Atherosclerosis

Introduction

Ocular ischemic syndrome (OIS) is a rare condition, which is caused by ocular hypoperfusion. The most common etiology of OIS is severe unilateral or bilateral atherosclerotic disease of the internal carotid artery or marked stenosis at the bifurcation of the common carotid artery. Ocular signs and symptoms may be the first manifestations of carotid artery disease. OIS originally was described by Hedges, in 1963 and initially was called venous stasis retinopathy. In the same year, Kearnst and Hollenhorst reported ocular symptoms and signs in association with advanced carotid artery stenosis⁽¹⁾. The term ocular ischemic syndrome has been coined for the sum of ocular symptoms and signs that may accompany carotid artery occlusive disease. Common ocular findings may include advanced unilateral cataract, anterior segment inflammation, asymptomatic anterior chamber reaction, macular edema, dilated but non-tortuous retinal veins, mid-peripheral dot and blot

24 hemorrhages, cotton wool spots, exudates, neovascularization of the disc and retina. Disease of the
25 endocrine system can be the cause of secondary hypertension, the most common benign primary
26 hyperaldosteronism, pheochromocytoma and Cushing's disease ⁽²⁾. Primary hyperparathyroidism
27 (PH) is an endocrine disorder in which any of the four parathyroid glands release an excessive
28 amount of parathyroid hormone and is usually the result of benign tumors, or adenomas, on the
29 parathyroid glands. Increased parathyroid hormone results in increased calcium level in the blood
30 and urine. Hypercalcemia due to PH, have been also associated with atherosclerotic disease and high
31 blood pressure. The mechanism has still to be elucidated as receptors for PTH have not been found
32 in significant levels on human endothelial cells. However, disturbed functional properties of the
33 vascular wall, which are generally believed to precede atherosclerosis, have been reported to be
34 associated with PH ⁽³⁾. The secondary hypertension associated with the PH in 10%-70 of patients
35 ⁽⁴⁾. Simultaneous bilateral ocular involvement is even less common and has been reported in only
36 22% of all cases of OIS. According to our knowledge, PH has not been described as a cause OIS. We
37 report a rare case of a 63 year-old woman with bilateral OIS and parathyroid adenoma.

38 **Presentation of case**

39 A 63 year-old female complained of decreased visual acuity and a scratching feeling in both eyes.
40 The decrease in visual acuity, accompanied by pain in the eyes and periorbital area, began three
41 days prior to the examination. Systemic history revealed extremely high blood pressure treated as
42 primary essential hypertension with multiple episodes of renal colic. On admission the blood
43 pressure was 240/160 mmHg and best corrected visual acuity was 6/60 in the right eye and 6/30 in
44 the left eye. The intraocular pressure was 18 and 16 mmHg in the right and left eye, respectively. Slit
45 lamp examination revealed bilateral mild cortical cataract and no evidence of iris neovascularization.
46 Dilated fundus examination of the right eye revealed narrowed retinal arteries and dilated retinal
47 veins (Figure 1a). Fundal examination of the left eye revealed occluded branches of the central
48 retinal artery with Hollenhorst plaque and the resulting areas of retinal hypoperfusion (Figure 1b).

49 Hemorrhages are located in the mid-periphery and retinal arterio-venous communications are
50 presents proximal to areas of avascular retina. Numerous small well-circumscribed areas of
51 hyperautofluorescence are presents in the sensory retina by fundus autofluorescence (Figure 2a,
52 2b). Optic disc swelling and thinning of surrounding nerve fiber layers is seen bilaterally by using OCT
53 (Figure 3). The total thickness and volume of the macula is decreased bilaterally (Figure 3b).
54 Standard Automated Perimetry, SITA 24.2 protocols, shows arcuate scotoma in the right eye and
55 central scotoma in the left eye. Fluorescein angiography reveals multiple occlusions of peripheral
56 arterial branches bilaterally, numerous arterial collaterals but no signs of choroidal
57 neovascularization. The Color Doppler ultrasonography measurements parameters of the
58 ophthalmic artery and central retinal artery are showed bilaterally decreased perfusion pressure. A
59 scan and B-scan ultrasonography revealed dense echoes compatible with calcium, with orbital
60 shadowing (Sclerochoroidal calcification) (Figure 4a). Thorough laboratory workup shows: increased
61 serum PTH 420 pg/mL; increased serum calcium 13, 2 mg/dL and decreased serum phosphorus 1, 2
62 mg/dL. Computed tomography of the head showed diffuse calcifications of brain tissue and multiple
63 old lacunar ischemic lesions. Doppler ultrasound of the neck confirmed significant stenosis of carotid
64 arteries, as well as an eroded plaque at the bifurcation of the left common carotid artery (Figure 4b).
65 An endocrinology consult confirmed the diagnosis of PH. 99mTc-methoxyisobutylisonitrile
66 parathyroid scintigraphy (MIBI scintigraphy) confirmed the existence of active parathyroid gland
67 adenoma bilaterally (Figure 5). The patient was referred to the Endocrinology Clinic where multiple
68 endocrine neoplasias were excluded as a diagnosis. It was concluded that surgical removal of the
69 parathyroid gland is necessary and after surgery histopathological findings indicates parathyroid
70 adenoma.

71 Discussion

72 The OIS encompasses the ocular signs and symptoms that result from chronic vascular insufficiency.
73 Patients also have significant known or unknown systemic disease at the time of presentation of OIS.

74 Amaurosis fugax, Hollenhorst plaques, and venous stasis retinopathy demonstrated moderate
75 predictive value in identifying carotid artery occlusive disease ^(5, 6). A 5-year mortality of 40% in
76 patients who have ocular ischemic syndrome reflects the severity of their systemic vascular disease.
77 The main cause of death in these patients is ischemic heart disease, with stroke the second most
78 common cause ⁽⁷⁾. Early diagnosis of OIS is important because a significant improvement or the cure
79 of the condition can be achieved in most cases by surgical methods ⁽⁸⁾. The most commonly
80 encountered systemic diseases are hypertension, diabetes, ischemic heart disease, stroke, and
81 peripheral vascular disease. To a lesser extent, patients manifest OIS as a result of giant cell arteritis.
82 The differential diagnosis is excluded diabetic retinopathy, moderately advanced central retinal vein
83 occlusion, hyperviscosity syndrome, and autoimmune uveitis. Ophthalmologic changes
84 accompanying PH can be very severe and, as in our case, have limited therapy options. A significant
85 decrease in visual acuity can sometimes be the initial sign of PH and being well-acquainted with
86 calcium homeostasis of the eye could help diagnose this condition. The spectrum of ocular changes
87 can be a part of the masquerade syndrome, which makes differential diagnosis extremely important
88 ^(9, 10). Long-term studies which followed PH patients, who were either treated conservatively or
89 surgically, concluded that surgical treatment of parathyroid glands, is a very important factor in
90 treating systemic and ocular manifestations of the disease ^(11, 12).

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93 **Conclusion**

94 This case demonstrates for the first time, the bilateral ocular ischemic syndrome as a result of
95 atherosclerotic disease of the internal carotid artery associated with PH. OIS should be treated not
96 only by an ophthalmologist a more should by a multidisciplinary team.

97 **Ethical approval:** The cases study was approved by the local ethics committee according to the
98 principles of good clinical practice and with the ethical principles of the Declaration of Helsinki.

99 **Abbreviations:**

100 **OIS:** ocular ischemic syndrome

101 **PH:** primary hyperparathyroidism

102 **MIBI scintigraphy:** 99mTc-methoxyisobutylisonitrile parathyroid scintigraphy

103 **Consent:** Written informed consent was obtained from the patient for publication of this Case report
104 and any accompanying images.

105 **References:**

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Figure 1a: Photo fundus of the right eye revealed narrowed retinal arteries and dilated retinal veins



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139 **Figure 1b** Photo fundus of the left eye revealed occluded branches of the central retinal artery with
140 Hollenhorst plaque and hemorrhages in the mid-periphery.



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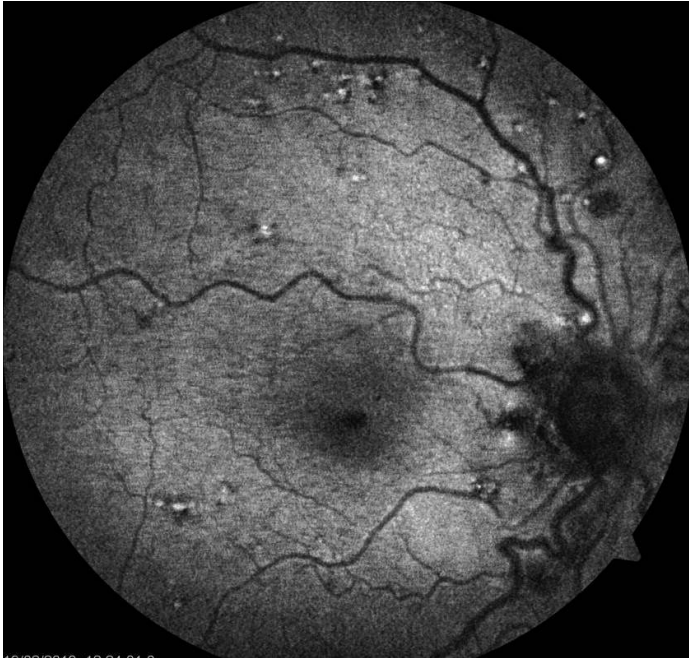
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146 **Figure 2a and 2b:** Numerous small well-circumscribed areas of hyperautofluorescence are presents

147 in the sensory retina by fundus autofluorescence.



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151 Figure 3a Optic disc swelling and thinning of surrounding nerve fiber layers is seen bilaterally by
152 using OCT.

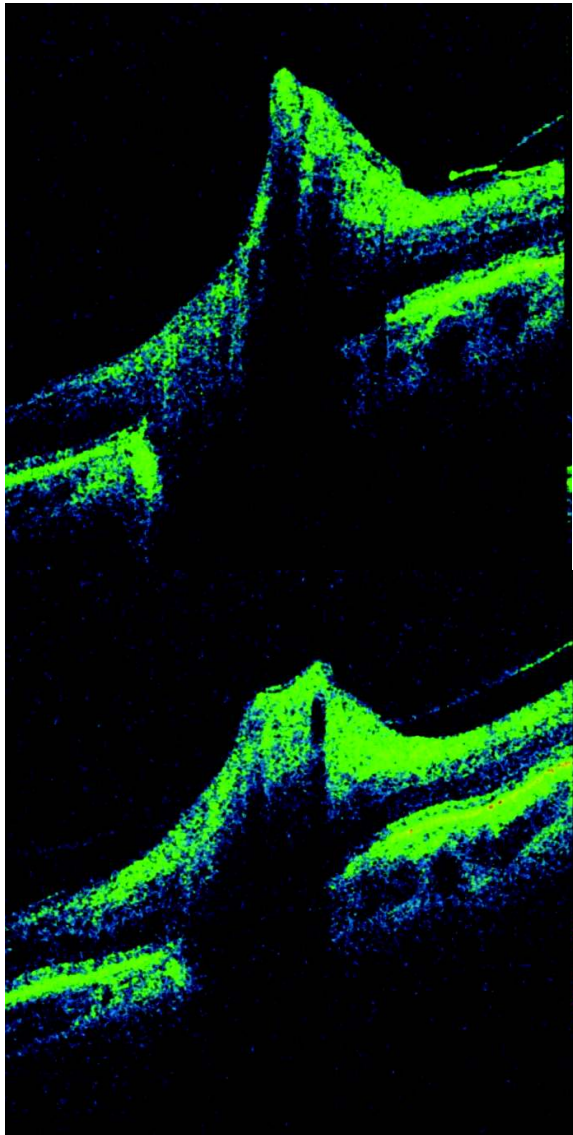
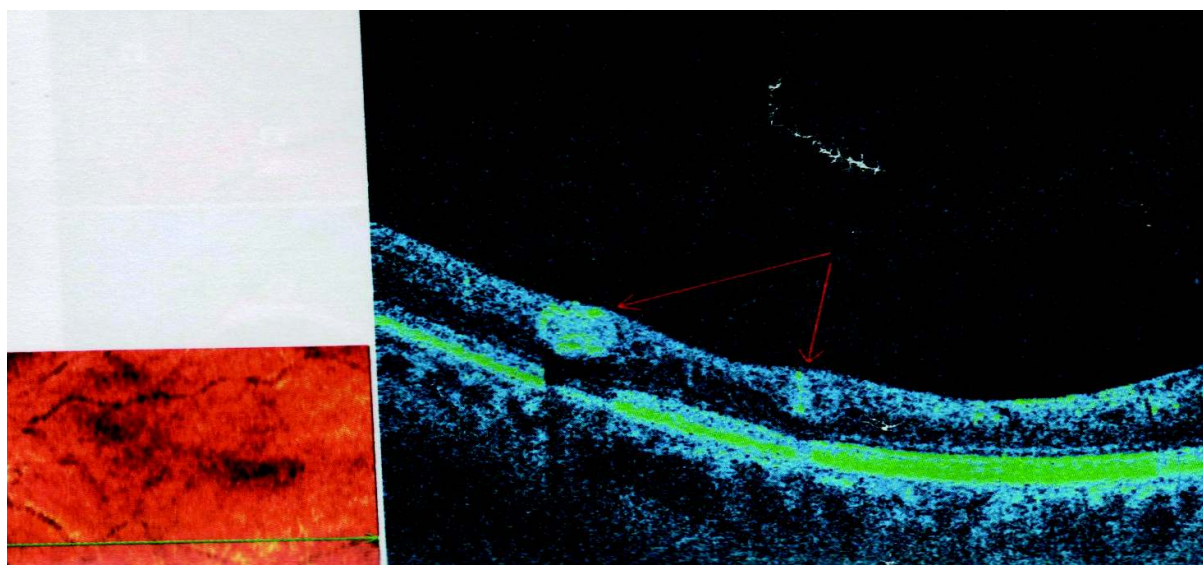


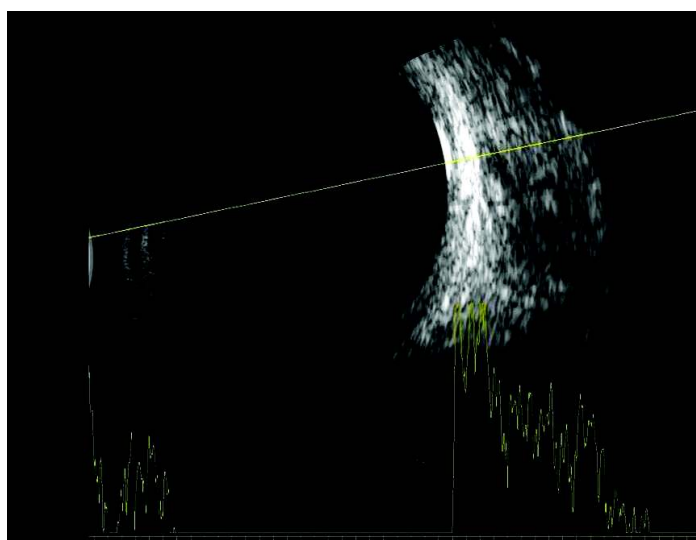
Figure 3b The total thickness and volume of the macula is decreased bilaterally by OCT. The arrows indicates to intraretinal calcium deposits.



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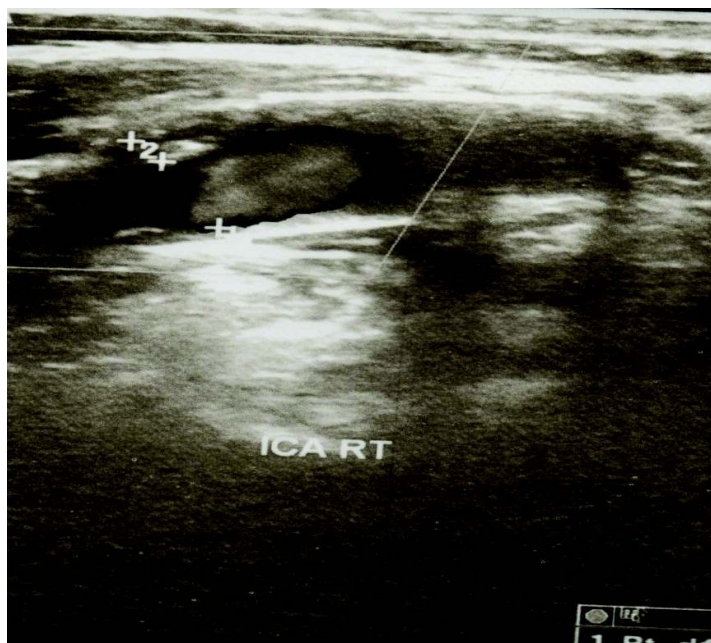
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162 **Figure 4a** B-scan ultrasonography revealed dense echoes compatible with calcium, with orbital
163 shadowing (Sclerochoroidal calcification)



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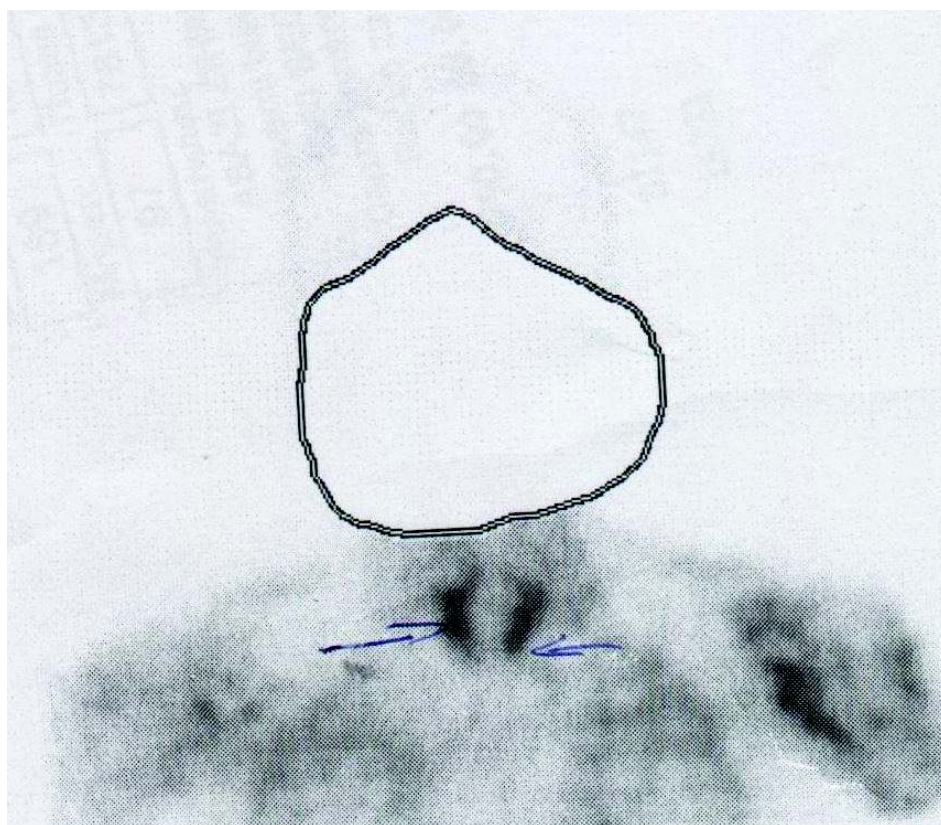
165 **Figure 4b** Doppler ultrasound of the neck confirmed significant stenosis of carotid arteries, as well as
166 an eroded plaque at the bifurcation of the left common carotid artery.



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169 **Figure 5** MIBI scintigraphy confirmed the existence of active parathyroid gland adenoma bilaterally.



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