Four Recti Enlargement at Orbital Apex and Thyroid Associated Optic Neuropathy

Anuchit Poonyathalang MD*, Pisit Preechawat MD*,
Jiraporn Laothammatat MD**, Orn Charuratana MD*

** Department of Ophthalmology, Ramathibodi Hospital Faculty, Mahidol University*
*** Department of Radiology, Ramathibodi Hospital Faculty, Mahidol University*

Objective: *To determine the site of muscle enlargement in thyroid-associated ophthalmopathy and optic neuropathy in Ramathibodi Hospital.*
Material and Method: *Data and images of MRI and CT of patients with thyroid-associated ophthalmopathy were retrospectively reviewed. Neuro-ophthalmologic data and correlation to the imaging findings were analyzed.*
Results: *Among 19 patients with thyroid-associated ophthalmopathy, 20 imaging studies were collected. There were 4 patients with bilateral disease and crowdedness of 4 recti muscle. All of them had thyroid associated optic neuropathy. One out of 19 patients underwent two different sessions study. During her first study, right optic nerve was involved with the crowding of right optic nerve but 7 months later her left optic nerve became involved with crowding of the left optic nerve and the right 4 recti appeared smaller.*
Conclusion: *Four recti muscle enlargement in thyroid-associated ophthalmopathy, like four-leaf clover in coronal section of imaging study, may be an important sign of thyroid associated optic neuropathy.*

Keywords: *Four-recti, Four-leaf-clover, Thyroid, Optic-neuropathy*

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Thyroid associated orbitopathy (TAO) is characterized with inflammation and enlargement of orbital tissue, in particular extraocular muscles. Optic neuropathy (ON) affects approximately 6% of patients with TAO[1]. Imaging is an important investigation when ON is suspected[1]. The aim of the present study was to determine the site of muscle enlargement in TAO cases or TAO cases with ON.

Material and Method

Included in the present study were consecutive patients with TAO who had imaging study and were seen from January 1999 to December 2003 at the Department of Ophthalmology, Ramathibodi Hospital. To diagnose TAO, each patient must have all three criteria: (1) typical history of TAO such as chronic painless proptosis, (2) typical thyroid eye signs such as lid retraction, white eye proptosis, restrictive myopathy, and (3) supporting imaging study, either normal or abnormal thyroid function test. Individual medical records and clinical features were retrospectively reviewed to divide patients into two clinical groups according to the presence or absence of ON. Diagnosis of ON was based on presence of any of the following findings, decreased visual acuity, abnormal visual field, color vision deficit or relative afferent papillary defect, without other intraocular abnormality. Orbital imaging, from computed tomographic scan or from magnetic resonance imaging of the patients was evaluated. One ophthalmologist and one radiologist recorded the sites of muscle enlargement in both coronal and horizontal planes, without knowing the history and ocular examinations of the patient. Patients were classified according to the site and character of muscular involvement: group A (four recti enlargement at orbital apex with four-leaf clover like character in coronal section) and group B (ocular muscle enlargement elsewhere or normal muscle). Clinical findings

Correspondence to : Poonyathalang A, Department of Ophthalmology, Ramathibodi Hospital Faculty, Mahidol University, Rama VI Rd, Bangkok 10400, Thailand. Phone: 0-2201-1560, Fax: 0-2201-1516, E-mail: raapy@mahidol.ac.th

and diagnoses were correlated within each group. High dose intravenous methylprednisolone were given for three days if the optic neuropathy was found. Orbital radiation was added if neuropathy was not improved. The present study was performed according to the guidelines of the 'Declaration of Helsinki' and was approved by the ethics committee of Ramathibodi Hospital.

Results

Of the 19 patients with TAO, there were 4 men and 15 women. The mean age at first presentation of all patients was 49.2 years, ranged from 22 to 71 years. Imaging studies were classified as group A in 4 cases, one episode in both eyes in 3 cases and 2 episodes in different eyes in 1 case (Fig. 1). Optic neuropathy was documented in all 4 cases, plus a fifth case in which mid-posterior part of the four recti muscles was markedly enlarged causing four leaf clover pattern anterior to orbital apex without fullness of apex itself.

In the case that had two episodes of four recti enlargement, her right eye was the first to have ON with visual acuity of finger counting and later gradually improved to 20/70 after treatment with high dose intravenous corticosteroid and radiation (Fig. 2). Eight months later, her left eye with four leaf clover sign also

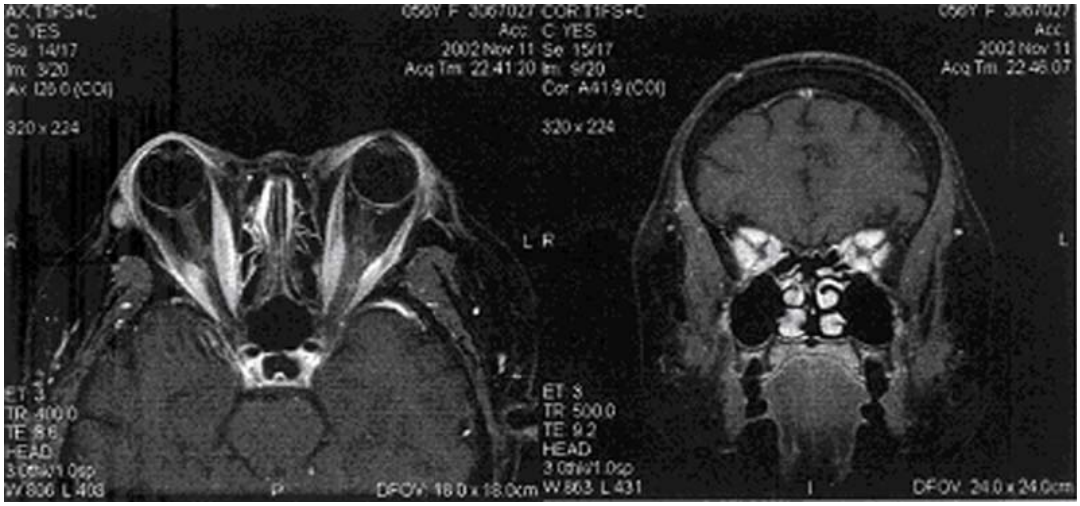

Fig. 1 MRI studies show four-leaf-clover sign with correlated posterior muscle enlargement

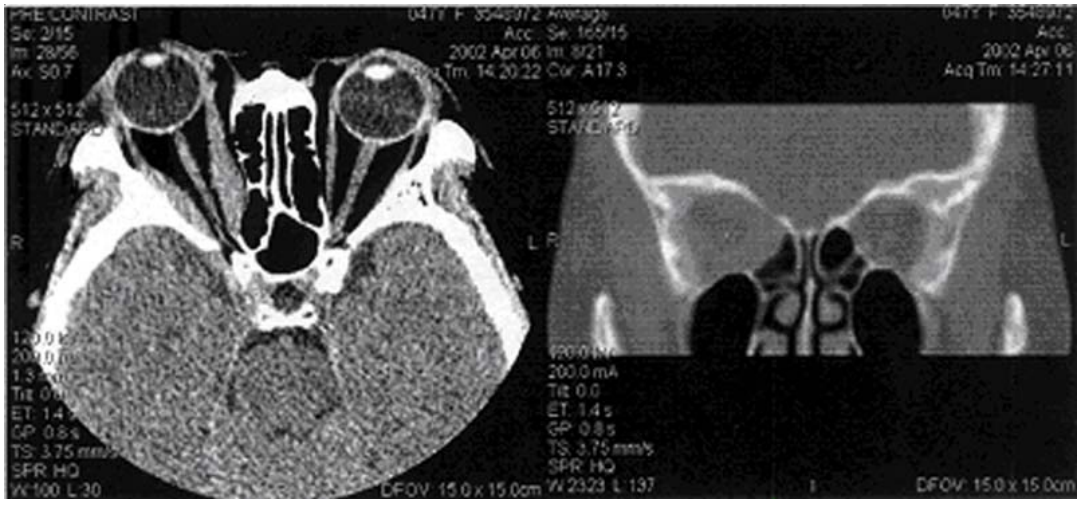

Fig. 2 CT scan of four-leaf-clover sign is demonstrated in the right eye with optic neuropathy

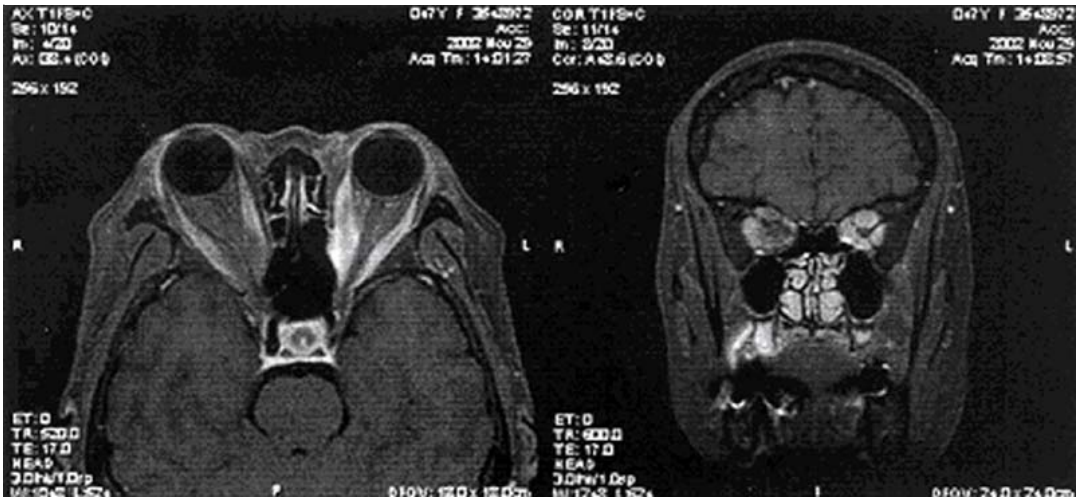

Fig. 3 MRI shows later left orbit developing the same sign, but the right eye has improved

developed ON while her right four recti were normal in size (Fig. 3). Hyperthyroid status was found in all 5 cases. In this group, imaging study showed slight proptosis.

In group B, muscle enlargement in mid-part occurred in 6 cases and in mid-posterior part in 7 cases. In 1 case the muscle size was normal. Ocular muscles in this group were not sufficiently enlarged to cause four-leaf-clover sign and no optic neuropathy was developed. There were 3 causes of visual loss: cataract in 2 cases, keratopathy in 2 cases and glaucoma in 1 case. Hyperthyroidism was found in 8 cases and 6 cases were euthyroid (Table 1).

Table 1. Clinical data and imaging data of the patients

Case	Age	Sex	Laterality	VA OD	VA OS	Optic Neuropathy	Disc	Visual field	Imaging
1	64	M	Bilateral	20/70	CF	No	Normal	ND*	MRI
2	30	F	Right	20/20	20/20	No	Normal	ND	CT
3	44	F	Right	20/20	20/20	No	Normal	ND	CT
4	22	F	Left	20/20	20/20	No	Normal	ND	MRI
5	57	M	Right	CF	20/20	No	ND	ND	CT
6	41	F	Bilateral	20/25	20/25	No	Normal	ND	CT
7	71	F	Bilateral	ND	ND	No	ND	ND	CT
8	47	F	Bilateral	CF3	20/25	Yes	Normal	Central Scotoma	CT&MRI
9	66	F	Bilateral	20/165	20/63	No	Normal	ND	MRI
10	37	M	Bilateral	20/20	20/30	No	Normal	ND	CT&MRI
11	48	F	Bilateral	15/200	10/200	Yes	edema	ND	MRI
12	71	F	Bilateral	20/30	20/50	No	Normal	normal	MRI
13	31	F	Left	20/20	2025	No	Normal	normal	MRI
14	56	F	Bilateral	20/40	20/50	Yes	Normal	constrict	MRI
15	62	M	Bilateral	20/25	20/25	No	Normal	normal	MRI
16	36	F	Bilateral	CF	CF	Yes	edema	ND	MRI
17	55	F	Bilateral	20/200	10/200	Yes	Normal	ND	MRI
18	38	F	Left	20/25	20/80	No	Normal	normal	MRI
19	38	F	Left	20/20	20/20	No	Normal	normal	MRI

VA = visual acuity, ND=not done,
CF = counting finger
* CASE NO.8 had two episodes of optic neuropathy

Discussion

Evidence suggested that the thyroid ON is probably caused by mechanical compression of optic nerve by the enlarged extraocular muscles and generalized increase intraorbital tissue[2,3]. In the present study, four-leaf clover like muscle enlargement at the orbital apex causing compression to the optic nerve seemed to be the cause of optic neuropathy. After intravenous high-dose corticosteroid and orbital radiation were administered, all improved except one case. This case that had two episodes of optic neuropathy had poor visual outcome in the first eye which may be caused by this ischemic mechanism because her optic nerve was chalky white swelling and pale shortly after the episode.

Ischemic event in this case may be associated with her engorged superior ophthalmic vein (SOV)[4]. Somer and Hartman have reported orbital blood flow reduction caused by compression of the SOV. Proptosis of the eye was not relevant to the SOV blood flow decrease in orbits. In the present study the proptosis of group A patient were also not prominent and the SOV were engorged.

From the present study with knowledge from other reports, the authors learned that the proptosis in patients with thyroid associated ON might not be severe[5]. Imaging study should be done to look for the four-leaf-clover sign and prompt high dose steroid treatment should be given.

Ischemic optic neuropathy should be considered if the optic disc is pale and does not respond to steroid treatment[6]. Some patients may have recurrent optic neuropathy based on steroids, these patients should be suspected to have autoimmune optic neuropathy in TAO[7]. The clinical periods of neuropathy were related to level of thyroid antibody. Treatments include pulse high dose steroid and immunosuppressive drugs.

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กล้ามเนื้อตาเรคไตขยายตัวทั้งสี่มัดบริเวณด้านในสุดของเบ้าตาและการเกิดเส้นประสาทตาผิดปกติจากไทรอยด์

อนุชิต ปุญญทลังค์, พิสิษฐ์ ปรีชาวัฒน์, จิรพร เหล่าธรรมทัศน์, อร เต็มภัทรโชค

วัตถุประสงค์: *เพื่อค้นหาบริเวณที่ขยายตัวของกล้ามเนื้อตาในโรคเบ้าตาผิดปกติจากไทรอยด์ และมีประสาทตาผิดปกติในโรงพยาบาลรามาธิบดี*

วัสดุและวิธีการ: *ทำโดยศึกษาภาพคลื่นแม่เหล็กไฟฟ้า และเอกซเรย์คอมพิวเตอร์ย้อนหลัง ในผู้ป่วยที่มีเบ้าตาผิดปกติจากไทรอยด์ และทำการวิเคราะห์ความสัมพันธ์ข้อมูลทางประสาทจักษุวิทยาและสิ่งที่พบในภาพดังกล่าว*

ผลการศึกษา: *การศึกษาได้ทำใน 19 ชุดภาพจากผู้ป่วย 18 ราย พบว่าในผู้ป่วย 3 ราย ที่มีกล้ามเนื้อตาเรคไตขยายตัวทั้ง 4 มัด ทุกรายพบมีประสาทตาผิดปกติ ในผู้ป่วยรายหนึ่งได้รับการศึกษาภาพเบ้าตาครั้งแรก ตาขวามีกล้ามเนื้อตาเต็มเบ้าตาในขณะที่ประสาทตาขวาผิดปกติ 7 เดือนต่อมาประสาทตาซ้ายผิดปกติและพบมีกล้ามเนื้อตาโต และในตาขวาซึ่งอาการประสาทตาดีขึ้นพบว่า กล้ามเนื้อตามีขนาดเล็กลง*

สรุป: *กล้ามเนื้อเรคไตขยายตัว 4 มัด ซึ่งดูเหมือนใบโคลเวอร์ชนิด 4 ใบในภาพเอกซเรย์ตัดขวางของเบ้าตาอาจเป็นลักษณะสำคัญอย่างหนึ่งของประสาทตาผิดปกติในเบ้าตาอักเสบจากไทรอยด์*