

## **Lacrimal glands herniation in patients with Graves' Ophthalmopathy: an effective MRI-derived marker of disease activity**

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## Aims and objectives

Graves ophthalmopathy (GO) is the most common extrathyroidal manifestation of Graves disease. It is important to identify the acute inflammation phase at an early stage to improve GO clinical outcomes.

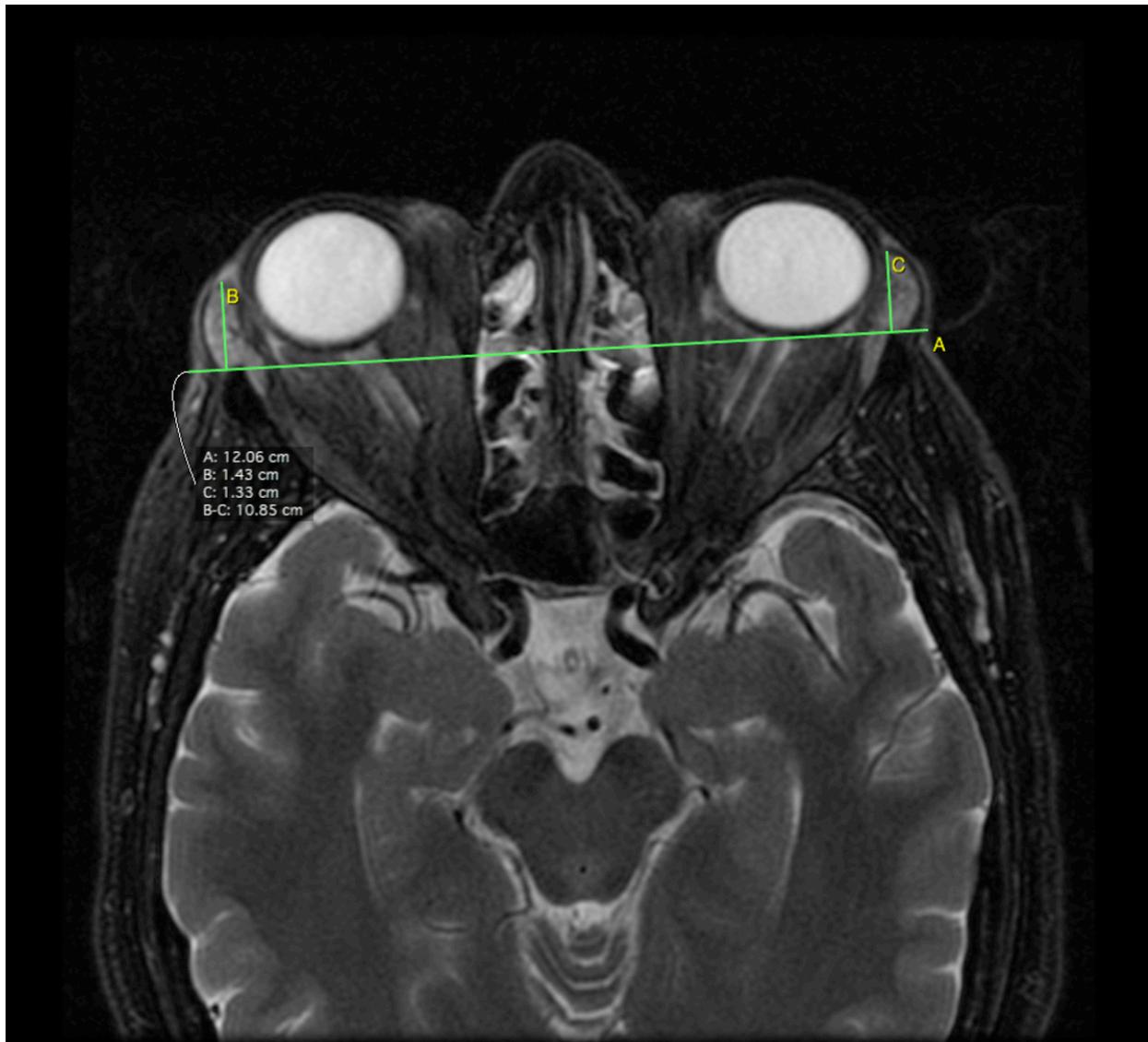
The lacrimal gland (LG) involvement in patients with GO has been considered as a potential cause of the associated GO symptoms [1-3] and different studies found that the LG measurements were significantly higher in patients with GO than healthy controls [4-6]. However, no data are available about the difference in LG volume between patients with different GO activity.

We evaluated the LG involvement measuring glands herniation by the use of magnetic resonance imaging (MRI), in patients with different GO activity.

## Methods and materials

Thirty-two consecutive Caucasian patients (10M, 22F, mean age 49.5, IR 30-68 yrs), affected by GO were enrolled and grouped in group A (n=16 with inactive GO, CAS<3) and B (n=16 with active GO, CAS#3) according to their GO activity. All patients underwent to a clinical, biochemical and morphological thyroid assessment, a complete ocular evaluation and an orbital MRI examination. Lacrimal glands herniation has been evaluated on axial MRI sequences by drawing a line between the right and left ventral zygomatic border (interzygomatic line). This line is commonly drawn at the level of the lens to evaluate the amount of proptosis (from there, a perpendicular line is taken to the apex of the globe, depicting the measurement of proptosis considering an Hertel-index of #22mm pathological). We drawn the interzygomatic line also at the level of the maximum depicted lacrimal glands herniation and, taking a perpendicular line, we measured the amount of lacrimal gland parenchyma protruding anteriorly (i.e.: lacrimal gland herniation).

Images for this section:



**Fig. 1:** Patient from group B (active GO, CAS#3); Axial T2w-FSE with FAT-SAT showing a significant lacrimal gland herniation is depicted on both eyes.

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## Results

No significant difference was found for the hormonal parameters and thyroid ultrasound-derived parameters between the two groups. TRAb levels resulted slightly higher, although not significantly, in group B [2.76 (0-40) vs. 1.74 (0-13.8) UI/L;  $p=0.073$ ]. The LC herniation measurement MRI-evaluated was significantly higher in the group B for both right [10.1 (7.3-17) vs. 7 (0-13.4) mm;  $p=0.004$ ] and left [8.5 (6.6-13) vs. 5.8 (0-12) mm;  $p=0.026$ ] eye than group A. A linear correlation was found between TRAb levels and LC herniation (Rho 0.462,  $p=0.009$ ) in all patients.

**Images for this section:**

	<b>Total population N 32</b>	<b>Group A CAS 0-2 N=16</b>	<b>Group B CAS 3-7 N=16</b>	
	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>p</i>
<b><i>Biochemical parameters</i></b>				
TSH $\mu$ UI/ml	1.01 (0-38)	1.61 (0.01-5.9)	0.63 (0-38)	0.402
FT3 (pg/ml)	3.25 (2.4-15.6)	3.32 (2.5-15.6)	3 (2.4-12.9)	0.776
FT4 (pg/ml)	12 (2.7-35.5)	12 (2.8-35.5)	12.1 (2.7-34.1)	0.804
TRAb (U/l)	2.12 (0.1-40)	1.74 (0.1-13.8)	2.76 (0.1-40)	0.077
<b><i>Ultrasound thyroid parameters*</i></b>		<b>N=13 *</b>	<b>N=13 *</b>	<i>p</i>
Right APD (mm)	20 (12-31)	20 (12-26)	20 (12-31)	0.470
Left APD (mm)	18.5 (11-29)	19 (12-29)	18 (11-25)	0.757
Istmo APD (mm)	5.5 (3-11)	5 (3-10)	6 (3-11)	0.360
Right PSV dx (cm/sec)	28.5 (12.2-69)	33.2 (16.4-69)	25.1 (12.2-68.3)	0.722
Left PSV (cm/sec)	31.5 (12.4-68)	35.6 (18.7-68)	26 (12.4-67.8)	0.903

**Fig. 2:** Thyroid biochemical and ultrasound parameters (APD: anteroposterior diameters; PSV: peak systolic velocity) \*evaluation performed in 26 patients without previous thyroidectomy

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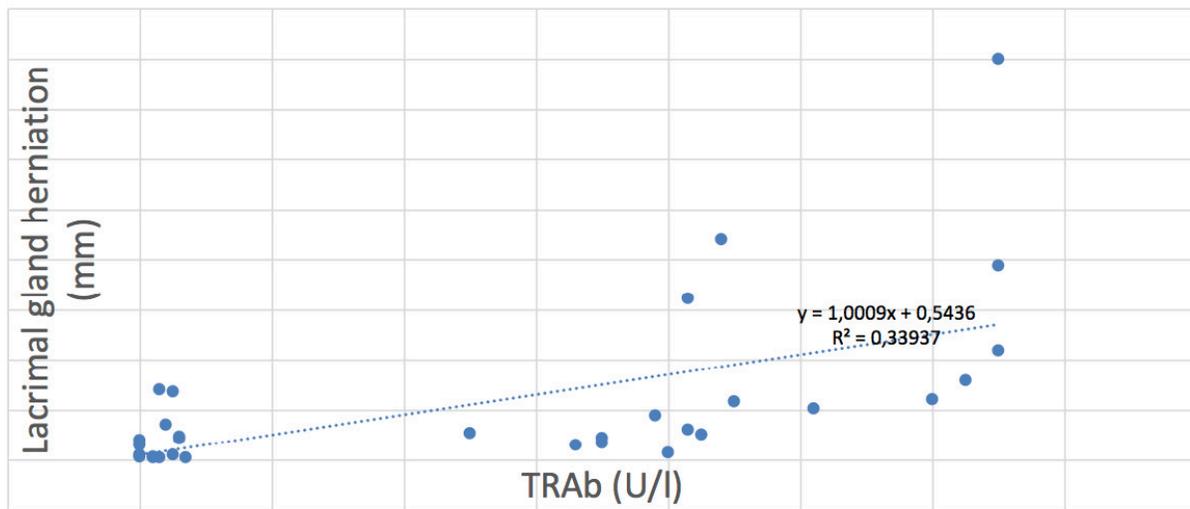
	<b>Total population N 32</b>	<b>Group A CAS 0-2 N=16</b>	<b>Group B CAS 3-7 N=16</b>	
	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>p</i>
Right proptosis (mm)	17 (11-26)	16 (11-21)	18 (12-26)	0.264
Left proptosis (mm)	18 (11-26)	18 (11-23)	18.5 (13-26)	0.101
Interpupillary distance	92 (79-110)	90 (79-98)	94 (85-110)	0.299
Right ocular pressure (mmHg)	12 (10-18)	12 (11-14)	13 (10-18)	0.110
Left ocular pressure (mmHg)	13 (11-18)	12 (11-14)	13 (11-18)	0.119
Right lid retraction (mm)	9 (6-14)	9 (7-11)	10 (6-14)	0.299
Left lid retraction (mm)	10 (7-13)	9 (7-11)	10 (7-13)	0.247
	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>p</i>
Diplopia presence	18 (56%)	5 (31%)	13 (81%)	0.003

**Fig. 3:** Ophtalmological clinical parameters in 32 GO patients.

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	<b>Total population N 32</b>	<b>Group A CAS 0-2 N=16</b>	<b>Group B CAS 3-7 N=16</b>	
	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>Median (IR)</i>	<i>p</i>
Right lacrimal gland herniation (mm)	8.50 (0-17)	7 (0-13.4)	10.1 (7.3-17)	0.004
Left lacrimal gland herniation (mm)	8.15 (0-13)	5.8 (0-12)	8.5 (6.6-13)	0.026
Right proptosis (mm)	21.8 (15.1-27.7)	20 (15.1-26.2)	23.3 (20-27.7)	0.021
Left proptosis (mm)	20.3 (13.3-26.9)	19.8 (13.3-26.2)	23.7 (18-26.9)	0.036

**Fig. 4:** MRI derived parameters for the evaluation of lacrimal glands characteristics.



**Fig. 5:** Correlation between TRAb levels and lacrimal gland herniation.

## Conclusion

The measurement of the lacrimal gland herniation seems to be a good marker of the activity of GO as evidenced by the significant difference between the two groups of patients. The correlation between TRAb levels and the degree of lacrimal gland herniation may suggest a more relevant role of the lacrimal gland involvement in the pathogenesis of GO. Future studies in a larger group of patient with different degree of GO activity will confirm these preliminary data.

## Personal information

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