

Eyelid Retraction, Lid Lag, Lagophthalmos, and von Graefe's Sign

Quantifying the Eyelid Features of Graves' Ophthalmopathy

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Purpose: To report the frequency and relationship of eyelid retraction, lid lag, lagophthalmos, and von Graefe's sign in a group of patients with Graves' ophthalmopathy and compare these findings to those in a group of normal individuals.

Design: Retrospective comparative cohort study.

Participants: Fifty consecutive Graves' ophthalmopathy patients were compared to a control group of 50 normal individuals.

Methods: Measurements were made of eyelid position in primary gaze and downgaze to assess eyelid retraction and lid lag, and the presence of lagophthalmos and von Graefe's sign was noted when present.

Main Outcome Measures: Eyelid position in primary gaze and downgaze and presence of lagophthalmos and von Graefe's sign.

Results: In the Graves' group, eyelid retraction (38%), von Graefe's sign (36%) and lagophthalmos (16%) were observed at a significantly greater frequency ($P < 0.01$) than in normals, whereas true eyelid lag was observed in only 8% ($P = 0.67$).

Conclusions: The terms *lid lag* and *von Graefe's sign* have been used interchangeably in the past; however, they are distinct signs of downgaze-related upper eyelid static position and dynamic movement, respectively. Although von Graefe's sign was commonly exhibited in Graves' patients, the relatively low frequency of lid lag suggests that factors other than restriction/fibrosis are likely responsible for the etiology of eyelid retraction in many cases. *Ophthalmology* 2008;115:1083–1088 © 2008 by the American Academy of Ophthalmology.

A variety of eyelid abnormalities and signs, including eyelid retraction, lid lag, von Graefe's sign, and lagophthalmos, have been described in association with Graves' ophthalmopathy.^{1–21} Eyelid retraction is considered a common finding that may involve the upper or lower eyelid. Indeed, eyelid retraction is a feature that has been suggested as one of the prime diagnostic criteria for Graves' ophthalmopathy.¹ Eyelid retraction in the setting of Graves' disease can produce widening of the palpebral fissure, referred to as Dalrymple's sign.^{2,3} The definition of eyelid retraction varies, however. For the upper eyelid, Day stated that its retraction is present when it "rests just below, at the level of, or above the limbus."³ Bartley et al consider eyelid retraction present when the upper eyelid is at or above the corneal limbus.^{1,5} According to Small, upper eyelid position in normal patients may be up to 5.5 mm above the midpupil (or center of the cornea), and upper lid retraction with superior scleral show occurs when the upper eyelid is ≥ 6.0 mm above the midpupil.⁴ Other authors have similarly defined upper eyelid retraction as being present when the upper

eyelid is above the superior corneoscleral limbus, thus producing superior scleral show.²⁰

Lid lag, von Graefe's sign, and lagophthalmos are additional eyelid findings described in the setting of Grave's disease. However, within the medical literature there appears to be some variation in how these terms are used. In 1981, Harvey and Anderson published an important article reviewing the historical, etymological, and clinical basis of these terms.⁶ *Lagophthalmos* is generally understood to mean an inability to close the eyes. Interestingly, it is derived from the Greek word *lagos*, referring to a hare or rabbit, an animal that was believed to sleep with its eyes open. Mechanisms for lagophthalmos include physiologic, orbital, mechanical, myogenic, and neurogenic causes.⁶ Lagophthalmos can be measured as the height of the palpebral fissure on incomplete closure or simply documented as present or absent.

The terms *eyelid lag* and *von Graefe's sign* have been used differently and sometimes interchangeably in the literature. Some authors^{3–7} have equated both terms to mean a failure of the upper eyelid to maintain its relative position

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with respect to the globe as the eyes are moved progressively downward. However, according to Harvey and Anderson and other authors^{22,23} eyelid lag is most accurately defined as a static phenomenon (abnormality) of upper eyelid position in downgaze, in which “with the eye in downgaze, the eyelid assumes a position higher than normal.”⁶ Lid lag can be quantified by measuring the palpebral fissure or, more accurately, the upper eyelid position in downgaze compared with its position in primary gaze relative to a fixed point on the globe such as the midpupil or cornea. When lid lag is present, the upper eyelid assumes and maintains a higher position, with downgaze fixation relative to its position in primary gaze fixation.^{6,15,22,23} In addition to Graves’ ophthalmopathy, lid lag may be produced by a number of causes including congenital, mechanical, or iatrogenic etiologies.⁶ For example, lid lag is a well-known common finding in the setting of congenital blepharoptosis, attributed to a stiff or fibrotic poorly developed levator muscle.^{15,22,23}

In contrast to eyelid lag, von Graefe’s sign is a dynamic phenomenon (abnormality) of eyelid movement.⁶ Described by Albrecht von Graefe in 1864, according to Harvey and Anderson’s translation of the original German publication, it is “an abolishment of coordination between eyelid movement and vertical eye movements.”⁶ Specifically, as the eye moves down, the upper eyelid does not follow along smoothly as in normal individuals but, rather, at a slower rate, often exposing the superior limbus during the descent. This is a dynamic sign in which the eyelid descent is retarded during the downgaze movement of the globe and is distinct from the position the eyelid assumes and maintains, once the final downgaze position (fixation) of the eye has been achieved.⁶ Because von Graefe’s sign is dynamic, it is difficult to assign a numerical value, and the sign is typically recorded simply as present or absent. In support of this terminology, *Dorland’s Medical Dictionary* also defines von Graefe’s sign as a “failure of the upper lid to move downward promptly and evenly with the eyeball in looking downward, instead it moves tardily and jerkily.”²¹

Although these eyelid manifestations of Graves’ ophthalmopathy have been described, few studies have examined the frequency and relationship of each of these eyelid signs in the same cohort of patients with Graves’ ophthalmopathy. The purpose of the current study was to evaluate the frequency and relationship of eyelid retraction, lid lag, lagophthalmos, and von Graefe’s sign in a consecutive series of patients with Graves’ ophthalmopathy and compare these with a group of normal subjects.

Materials and Methods

We retrospectively evaluated 50 consecutive patients with Graves’ ophthalmopathy referred to the senior author’s practice (DRM) during a 2-year period. In most patients, the diagnosis of Graves’ disease was based on endocrinologic evaluation by the patient’s referring internist or endocrinologist. Prior thyroid treatments included no therapy, oral medical therapy (including β -blockers or antithyroid agents), radioactive iodine treatment, or thyroidectomy. Similar to Bartley et al, we considered Graves’ ophthalmopathy present if eyelid retraction occurred in association with

objective evidence of thyroid dysfunction, exophthalmos, optic nerve dysfunction, or extraocular muscle involvement (the ophthalmic signs may be unilateral or bilateral). For the purpose of this study, exophthalmos was considered present if Hertel exophthalmometry was >20 mm or asymmetry 0.2 mm. Extraocular muscle involvement was defined as restrictive ocular motility on clinical evaluation or computed tomographic evidence of multiple extraocular muscle enlargement. Optic nerve dysfunction was defined as abnormal visual acuity, papillary reaction, or perimetry or color vision deficit not attributable to other causes. If eyelid retraction was absent, Graves’ ophthalmopathy was diagnosed if exophthalmos, optic nerve involvement, or restrictive extraocular myopathy was associated with thyroid dysfunction or abnormal regulation and if no other cause for the ophthalmic findings was apparent.^{1,14} Patients with prior eyelid or orbital surgery, orbital radiotherapy, or a history of myasthenia gravis were excluded.

Eyelid position and movement were assessed as part of the routine patient evaluation as follows. In each patient, upper and lower eyelid position was measured from the central corneal light reflex using a standard ruler to the nearest 0.5 mm, as previously described.^{23,24} The position of upper eyelid margin to corneal reflex distance (uMRD) and lower eyelid margin to corneal reflex distance (lMRD) were obtained in resting primary gaze position and at 30° to 40° downgaze. The interpallebral fissure height was calculated as the algebraic sum of uMRD plus lMRD. In this study, eyelid retraction was defined as uMRD > 5.5 mm. Given that the average vertical corneal diameter is 11 mm,^{4,24} a uMRD of 5.5 mm is approximately at the superior corneal limbus, and a uMRD > 5.5 mm is typically above the limbus and associated with superior scleral show. Eyelid lag was considered present if the uMRD with the eye fixing in downgaze was greater than the uMRD in primary gaze, yielding a positive change in uMRD (i.e., higher upper eyelid position in downgaze).^{6,23} Lagophthalmos was considered present if there was incomplete closure of the eyelids allowing any portion of the globe to remain exposed, after patients were asked to close their eyelids as if they were sleeping.⁶ von Graefe’s sign was noted as present if the patient exhibited a pause or retarded descent of the upper eyelid with initiation of downgaze eye movement from primary gaze.⁶

For statistical comparison, the eyelid measurements of a group of 50 otherwise healthy individuals were used, as previously described.²⁴ Data were analyzed using a 2-tailed Student’s *t* test and χ^2 analysis with the level of statistical significance considered at $P < 0.05$. Although measurements were performed on both eyes of all patients, for statistical analysis only the data from the right eye in Graves’ patients and controls was utilized.

Results

Mean eyelid position in primary gaze and downgaze and the change in gaze position (downgaze eyelid position minus primary gaze eyelid position) are listed for the 50 Graves’ patients and 50 normal individuals in Table 1. The variables upper eyelid retraction, eyelid lag, lagophthalmos, and von Graefe’s sign were further compared using χ^2 analysis and are shown in Table 2.

For mean upper eyelid position in primary gaze, there was a statistically significant difference between the 2 groups, with the Graves’ group demonstrating a higher position of 5.4 mm (± 1.7), versus 4.1 mm (± 1.0) in the normal group ($P < 0.001$). The interpallebral fissure height also significantly differed between the 2 groups, with the Graves’ group having a wider vertical interpallebral fissure, 11.2 mm (± 2.1), versus 9.9 mm (± 1.3) in the normal group ($P < 0.001$). As shown in Table 2, lid retraction, defined as uMRD > 5.5 mm, was present in 19 of 50

Table 1. Eyelid Position in Primary Gaze and Downgaze in Patients with Graves' Ophthalmopathy versus Normal Individuals

Gaze	uMRD (mm)	IMRD (mm)	IPF (mm)
Primary			
Graves'	5.4±1.7	5.8±0.8	11.2±2.1
Normal	4.1±1.0	5.8±0.7	9.9±1.3
Downgaze			
Graves'	4.6±2.0	3.7±0.7	8.2±2.3
Normal	3.1±1.4	4.5±0.9	7.6±1.6
Change			
Graves'	-0.8±1.1	-2.1±0.6	-2.9±1.4
Normal	-1.0±0.8	-1.3±0.8	-2.3±1.1

IPF = interpupillary fissure height; IMRD = lower eyelid margin to corneal reflex distance; uMRD = upper eyelid margin to corneal reflex distance.

(38%) of the Graves' patients, versus 4 of 50 (8%) in the normal group ($P = 0.001$).

The following observations regarding lid lag were made. The mean change in uMRD from primary gaze to downgaze was -0.8 mm (± 1.1) in Graves' patients, versus -1.0 mm (± 0.8) in the normal group. This difference was not statistically significant ($P = 0.30$). The numbers of patients exhibiting lid lag defined as an increased (higher) upper eyelid position (e.g., positive change in uMRD) in downgaze were 4 of 50 (8%) in the Graves' group and 2 of 50 (4%) in the normal control group. χ^2 analysis showed no significant difference ($P = 0.673$) between the 2 groups, although the numbers were small. The majority of patients in the Graves' study group, 37 of 50 (74%), showed a decreased upper eyelid position (negative change in uMRD) in downgaze, with the remainder, 9 of 50 (18%), showing no change in upper eyelid position in downgaze.

Although the primary focus of this study was upper eyelid position, lower eyelid position data were also analyzed. All Graves' patients exhibited a decrease in IMRD on downgaze, as did all 50 normal subjects. The mean change in IMRD from primary gaze to downgaze was -2.1 mm (± 0.6) in the Graves' group, versus -1.3 mm (± 0.8) in the normal group ($P < 0.001$). The interpupillary fissure in primary gaze versus downgaze also showed a significant difference in the Graves' patient group, exhibiting a mean change of -2.9 ± 1.4 mm versus -2.3 ± 1.1 mm ($P = 0.013$). As can be seen from these data, the relative contribution of the mean change in lower eyelid position to the mean interpupillary fissure change was greater than that of the mean change in upper eyelid position in downgaze.

As shown in Table 2, lagophthalmos was observed in 8 of 50 (16%) of the Graves' group and in none of the normal group ($P = 0.010$). von Graefe's sign was observed in 18 of 50 (36%) of the Graves' group and in none of the normal group ($P < 0.001$).

Paired comparisons of the eyelid variables within the Graves' study group were also analyzed using χ^2 analysis and are presented in Table 3. Within the Graves' group, eyelid retraction and von Graefe's sign exhibited a highly significant association ($P < 0.001$). None of the other eyelid variables showed a statistically significant relationship.

Discussion

Graves' ophthalmopathy is associated with a variety of eyelid findings. The exact frequency of these findings varies

in previously published studies. Furthermore, different interpretations of the nature of these signs and their diagnostic criteria have complicated comparison across studies. In this study of 50 consecutive patients with Graves' ophthalmopathy, we found that eyelid retraction, defined as uMRD > 5.5 mm, occurred in 38%, von Graefe's sign in 36%, true lid lag (i.e., upper eyelid higher in downgaze) in 8%, and lagophthalmos in 16%. Few studies have examined the interrelation of each of these signs in the same study and performed statistical comparison with normal individuals.

Frueh et al in a study of 81 patients with Graves' ophthalmopathy found that mean (right eye) midpupil-to-lid margin distance (essentially equivalent to the uMRD measurement used in our study) was 4.9 mm, which was significantly different than the 3.5-mm distance in their group of 111 normal subjects.^{12,13} Similarly, palpebral fissure measurements differed significantly between the groups: 11.9 mm in the Graves' group versus 9.0 mm in the normal group. In our study, we also found that the Graves' group demonstrated a significantly higher mean uMRD, 5.4 mm, compared with the normal group mean uMRD of 4.1 mm, as well as a higher mean palpebral fissure measurement of 11.2 mm, versus 9.9 mm. The values in the Frueh et al study and ours are in close agreement and confirm the expectation that average upper eyelid position in primary gaze is, indeed, higher in patients with Graves' ophthalmopathy. What is the frequency of upper eyelid retraction in patients with Graves' ophthalmopathy? The answer to this question depends, in part, on the measurement and threshold criteria selected. In our study, upper eyelid retraction was defined as uMRD > 5.5 mm, the point at which the eyelid is typically above the limbus and scleral show is evident in most patients. This criterion is in concordance with the definition of eyelid retraction advocated by Small and others.^{4,20} Using this criterion, 19 of 50 (38%) of Graves' patients versus 4 of 50 (8%) of normal subjects in our study demonstrated eyelid retraction. If a different threshold for upper eyelid position is selected, however, the frequency of eyelid retraction may change. For example, Bartley et al defined *upper eyelid retraction* as upper eyelid position "at or above the superior corneoscleral limbus"^{1,5} and, in their incidence cohort study, reported that this finding was present "at the time of diagnosis in 75% of patients with Graves' ophthalmopathy and in 90% of patients at some point in their clinical course."² Looking more specifically at the right eye data

Table 2. Eyelid Variables: Graves' Ophthalmopathy Patients versus Normal Individuals

	Graves'	Normals	P Value
Lid retraction	19	4	0.001
No lid retraction	31	46	
Lid lag	4	2	0.673
No lid lag	46	48	
Lagophthalmos	8	0	0.010
No lagophthalmos	42	50	
von Graefe's sign	18	0	<0.001
No von Graefe's sign	31	50	

Table 3. Eyelid Variables: Relationship within the Graves' Group

	von Graefe's Sign (+)	No von Graefe's sign (-)	P Value	Lid Retraction (+)	No Lid Retraction (-)	P Value	Lagophthalmos (+)	No Lagophthalmos (-)	P Value
Lid lag (+)	3	1		3	1		2	2	
No lid lag (-)	15	31	0.250	16	30	0.293	6	40	0.222
Lagophthalmos (+)	4	4		5	3				
No lagophthalmos (-)	14	28	0.618	14	28	0.246			
Lid retraction (+)	12	7							
No lid retraction (-)	6	25	<0.001						

from their study, lid retraction was noted in 67% of their patients. If we were to include patients with upper eyelids at the superior limbus as well as those above the superior limbus (in other words, a more inclusive threshold of ≥ 5.5 mm), 25 of 50 (50%) of the Graves' patients in our study would be considered to have eyelid retraction.

The action and position of the upper eyelid on downgaze in patients with Graves' disease have been a topic of interest, as well as some confusion. When the upper eyelid moves from primary gaze to downgaze, the movement is by definition a dynamic process, whereas the final position the eyelid assumes in downgaze is a static measurement. The position of the upper eyelid in relation to the corneal reflex (or, similarly, the midpupil) can readily be documented with the eye in primary gaze and downgaze fixation. If uMRD increases on downgaze (i.e., positive change in uMRD), then the upper eyelid is higher in downgaze relative to its resting primary position, and eyelid lag is considered present. This definition of eyelid lag is consistent with current usage of the term for other conditions such as congenital ptosis.^{6,22,23} We found that eyelid lag using this definition occurred in only 8% of the Graves' group. This number is quite similar to the 8.6% frequency of lid lag (right eye data) in 105 patients reported in the study by Bartley et al.⁵ Interestingly, in our study, although this frequency was twice that noted in the normal group (4%), this difference was not statistically significant, with the caveat that the number in both groups with this finding was small. Like most normal individuals, the majority of Graves' patients demonstrated a slightly decreased upper lid position on downgaze. Indeed, the mean change in uMRD on downgaze did not significantly differ between the Graves' and normal groups (-0.8 mm vs. -1.0 mm, respectively).

In this study, we also paid careful attention to dynamic upper eyelid movement during downgaze and frequently noted a brief pause or delay in the descent of the upper eyelid, occurring in 36% of Graves' patients when downward gaze was initiated. We interpret this finding as indicative of von Graefe's sign, based on Harvey and Anderson's review and translation of the original German publication,^{6,21} in which "the upper eyelid appears to briefly stutter or pause before descending with downward movement of the globe." We believe that eyelid lag has been reported as von Graefe's sign (and vice versa) in some previous studies. For example, Day considered the terms synonymous, reporting a 33.5% frequency of lid lag (von Graefe's sign) in

his study of 200 patients with Graves' ophthalmopathy.³ Walsh and Hoyt also considered the terms *lid lag* and *von Graefe's sign* synonymous, defining both as "a failure of the upper lid to lower simultaneously with lowering of the eyeball," and suggested it occurred with a frequency of "somewhat less than 50%" in Graves' patients.⁷ They further suggested that in most instances lid lag parallels the degree of eyelid retraction. Separately evaluating these variables, we statistically confirmed an association between eyelid retraction and von Graefe's sign ($P < 0.001$) but not an association with lid lag, as defined in this study.

Lagophthalmos is a generally well-accepted term that describes incomplete eyelid closure. It should be noted that both upper and lower eyelid abnormalities can contribute to lagophthalmos. In this study, we found that lagophthalmos occurred in 16% of patients with Graves' ophthalmopathy. Bartley et al reported lagophthalmos in approximately 10% (right eye data) of 102 patients with Graves' ophthalmopathy.⁵ Some physicians have suggested that lagophthalmos may be more commonly seen in the setting of lid retraction or lid lag; however, we were not able to statistically confirm such a relationship in our study.

Although it was not the primary focus of this study, we also evaluated lower eyelid position and found that the lower eyelid exhibited a significant mean change in primary gaze to downgaze position, with a more reduced downward excursion relative to downward globe movement in the Graves' group than in the normal group. The resulting change in palpebral fissure width on downgaze was also significant, with the change in lower lid position contributing relatively more than the change in upper lid position. The significant contribution of the change in lower eyelid position to the change in palpebral fissure in downgaze supports the previous caveat that caution should be observed when interpreting or extrapolating change in upper eyelid position (or physiology) from measurements taken only of the palpebral fissure.^{15,16}

The general mechanisms of eyelid retraction have been cited in the past and include mechanical, myogenic, or neurogenic causes.¹⁷ However, the precise cause of eyelid retraction associated with Graves' ophthalmopathy is a subject of great debate. Although it was not the primary intent of this study to answer this question, the implications of our findings merit some discussion. Feldon and Levin investigated the levator/superior rectus muscle complex and the inferior rectus muscle in patients with Graves' ophthalmopathy. Extraocular muscle volume measurements were per-

formed, and the authors found that eyelid retraction and lid lag did not correlate with the levator/superior rectus muscle volume, limitation of vertical eye movements, or inferior rectus muscle volume.¹¹ They favored the theory of local adhesion (i.e., adhesions between the levator aponeurosis and surrounding tissues) for the etiology of eyelid retraction. Grove also suggested a restrictive mechanism to explain the eyelid retraction observed with Graves' ophthalmopathy.¹⁹ Although restriction or fibrosis may be an explanation for the eyelid retraction seen in some Graves' patients, if restriction (fibrosis) was the principle and sole cause of the eyelid retraction seen in most patients with Graves' ophthalmopathy, we would hypothesize that the upper lid would more consistently exhibit increased retraction when the globe assumes the downgaze position (i.e., lid lag). The relatively modest number of Graves' patients demonstrating true lid lag would appear contrary to the theory that upper eyelid retraction in Graves' is predominantly due to a fibrotic process in the majority of patients. Unless some type of compensatory mechanism exists, a much greater absolute frequency of lid lag would be expected from fibrosis, as is seen, for example, rather consistently with most cases of congenital ptosis.^{15,22,23} However, in our study and in the cohort study by Bartley et al⁵ lid lag was not a common finding relative to the frequency of lid retraction, and even less so in the Graves' patient group on the whole. Intriguingly, however, in our study we did find that von Graefe's sign was a relatively more frequent finding that was also statistically associated with eyelid retraction. The transient pause in eyelid descent typifying von Graefe's sign, coupled with the generally decreased resting upper eyelid position observed in downgaze in many Graves' patients, may suggest that an increased stimulation of the eyelid retractors or innervational component contributes in whole or in part to eyelid retraction. Early on, Pochin suggested that eyelid retraction might be associated with excess innervation of the superior rectus/levator complex,⁸ as did Wesley and Bond.⁹ Hamed and Lessner also suggested that increased innervation (fixation duress) could cause lid retraction secondary to a tight antagonistic inferior rectus muscle.¹⁰ We must acknowledge, however, that the etiology of lid retraction may be heterogeneous and multifactorial and, indeed, may even differ in different subsets of patients with Graves' ophthalmopathy. The role of Mueller's muscle has also received little attention.

The limitations of our study should be acknowledged. The potential for referral bias certainly exists. Most patients were previously evaluated by an endocrinologist or general ophthalmologist and subsequently sent for further evaluation and management of their eye findings. Patients in this study group might demonstrate greater disease severity due to the tertiary nature of the senior author's practice (DRM). Disease activity and treatment may also affect the findings in Graves' ophthalmopathy. Similar to previous published studies on this topic, patients in this study were at various points of disease activity and treatment. Also, the normal individuals used for comparison, though all adult, were not strictly age matched, and some age effects on eyelid position cannot be fully excluded. For example, uMRD may decrease slightly with age. Also, IMRD measurements may

increase somewhat with age as a function of lower eyelid laxity and may be partly responsible for the similar lower eyelid measurements noted. Our measurement technique for eyelid position was to the nearest 0.5 mm, which typifies most clinical practices and previous similar studies. These measurements can be affected by attention, including the potential for increased eyelid retraction with attention, the so-called Kocher sign.² To minimize this variability, all measurements were obtained with a consistent technique, with the patient in resting primary gaze position, fixating on the target light. Downgaze position at 30° to 40° was chosen as a practical level to perform downgaze measurements and allow comparison with previous similar studies.^{15,23,24} Downgaze measurements outside of the 30° to 40° range could produce different results. Finally, the rationale for the definitions and criteria used in this study to consider whether a sign was present or absent were derived after careful review of the previous literature and a desire for consistency. This study was retrospective in nature and shares the inherent limitations of all retrospective studies. Further prospective study would be valuable to confirm our findings.

In summary, we have reported the frequency and relationship of eyelid retraction, lid lag, lagophthalmos, and von Graefe's sign in a group of patients with Graves' ophthalmopathy and compared these findings with those from a group of normal individuals. Eyelid retraction and von Graefe's sign were frequent findings in patients with Graves' ophthalmopathy. Lagophthalmos was also seen in a smaller but significant percentage of Graves' patients. Although true lid lag may be observed in patients with Graves' ophthalmopathy, it was observed with a frequency of <10% in this study. This relatively low frequency suggests that factors other than restriction/fibrosis are probably responsible for the etiology of lid retraction in many patients. In the past, the terms *eyelid lag* and *von Graefe's sign* have been used interchangeably; however, they are distinct signs of downgaze upper eyelid static position and dynamic movement, respectively. We hope the findings of this study will help to clarify and improve the evaluation of patients with Graves' ophthalmopathy.

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