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Original Article

A Nationwide Survey by the Korean Society of Ophthalmic Plastic and Reconstructive Surgery (KSOPRS) on the Management of Thyroid Eye Disease in South Korea

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Purpose: To evaluate current diagnostic and therapeutic practices among South Korean oculoplastic surgeons, with particular focus on adherence to guidelines and perspectives on emerging therapies such as teprotumumab.

Methods: A nationwide, anonymized online survey was conducted in May 2025 among members of the Korean Society of Ophthalmic Plastic and Reconstructive Surgery (KSOPRS). The questionnaire collected data on physician demographics, diagnostic and monitoring approaches, therapeutic strategies for mild and moderate-to-severe thyroid eye disease (TED), management of dysthyroid optic neuropathy, and perspectives on teprotumumab treatment.

Results: Thirty-two physicians participated in the study, most of whom practiced at tertiary centers. Most respondents (n = 28, 87.5%) utilized the Clinical Activity Score and the European Group on Graves' Orbitopathy severity classification. Intravenous (IV) glucocorticoid (GC) therapy was the predominant treatment for moderate-to-severe TED (n = 31, 96.9%), with adjunctive use of oral GCs, immunosuppressants (n = 13, 40.6%), and orbital radiotherapy (n = 29, 90.6%). In managing dysthyroid optic neuropathy, 19 respondents (59.4%) employed IV GC with radiotherapy, and 29 (90.6%) recommended decompression for refractory cases. Teprotumumab was considered primarily for GC-refractory cases, although its use was limited owing to cost and limited clinical experience. Functional assessments, including visual acuity and relative afferent pupillary defect, were prioritized over structural imaging in evaluating treatment response.

Conclusions: South Korean oculoplastic surgeons generally follow international TED guidelines, favoring IV GC and conventional therapies over biologics due to access and cost barriers. As biologics like teprotumumab become more accessible, region-specific guidelines integrating global evidence and local healthcare constraints will be critical for optimized patient care.

Key Words: Graves ophthalmopathy, Korea, Oculoplastic surgeons, Surveys and questionnaires, Thyroid eye disease

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Thyroid eye disease (TED), also known as Graves orbitopathy, is the most common extrathyroidal manifestation of Graves disease and reflects a localized expression of a systemic autoimmune process [1]. It is characterized by inflammation and expansion of the extraocular muscles and orbital connective tissue, leading to functional and aesthetic complications, including proptosis, diplopia, and, in severe cases, vision loss. Active TED is marked by ongoing inflammatory changes, and timely initiation of immunosuppressive therapy during this phase is critical for achieving optimal outcomes [2]. Delayed or inadequate treatment may result in irreversible fibrotic changes and reduced therapeutic response. Therefore, early recognition and appropriate referral by local physicians, particularly endocrinologists and general practitioners, are essential for effective management of TED.

Over the past decade, significant advances have been made in the diagnosis and treatment of TED, supported by evolving international consensus guidelines. The European Group on Graves' Orbitopathy (EUGOGO) published evidence-based guidelines in 2016 and updated them in 2021, providing structured recommendations on assessing disease activity, severity, and treatment strategies [3,4]. Similarly, the 2022 consensus from the American Thyroid Association (ATA) and the European Thyroid Association (ETA) further emphasized a multidisciplinary, severity-based approach in managing TED [5]. These guidelines have contributed to greater standardization in clinical decision-making across regions. Furthermore, the introduction of targeted therapies such as teprotumumab, a monoclonal antibody against insulin-like growth factor 1 receptor, has transformed the treatment paradigm, offering new options for patients with moderate-to-severe or treatment-refractory TED [6]. Consequently, the therapeutic landscape is rapidly evolving, with increasing interest in biologics and personalized treatment approaches.

Despite global advancements, no nationwide survey or established clinical consensus on TED management currently exists in South Korea. Given the distinct characteristics of the South Korean healthcare system, referral patterns, and accessibility to novel therapies, understanding current real-world practices and clinician perspectives is essential. In particular, with the potential introduction of new biologics such as teprotumumab into the South Korean market, foundational data are needed to guide future guidelines and policy decisions. Therefore, this study aimed to investigate the current state of TED diagnosis and treatment in South Korea, focusing on physician awareness of international guidelines, preferred treatment strategies, and perspectives on emerging therapies.

Materials and Methods

Ethics statement

The study protocol was approved by the Institutional Review Board of Yonsei University Severance Hospital, with a waiver of informed consent (No. 4-2025-0440).

Study population

A survey was conducted in May 2025 among members of the Korean Society of Ophthalmic Plastic and Reconstructive Surgery (KSOPRS), comprising oculoplastic surgeons specializing in TED treatment. The survey link was emailed to all 226 physicians registered with KSOPRS since its inception in 1988. Among them, 60 ophthalmologists were active members who had completed oculoplastic fellowship training. A total of 32 oculoplastic specialists (53.3 %) responded to the survey.

Survey instrument development and data collection

The survey was developed by three oculoplastic specialists and reviewed by the KSOPRS board. The questionnaire was designed to evaluate clinicians' awareness of the EUGOGO consensus and current clinical practices in TED management. It included items on physician demographics, hospital characteristics, diagnostic methods, and treatment approaches, including intravenous (IV) glucocorticoid (GC) therapy, orbital radiotherapy, immunosuppressive agents, serologic evaluation, and selenium supplementation for mild TED. The survey also addressed off-label use of tocilizumab, rituximab, and local triamcinolone injections, as well as management strategies for dysthyroid optic neuropathy (DON). Clinical scenarios were incorporated to assess perspectives on the potential use of teprotumumab in South Korea. The questionnaire also comprised single- and multiple-response items, along with questions evaluating relative treatment priorities. The original survey instrument is detailed in Supplementary Material 1.

The survey was administered electronically using a secure online platform (Google Forms, Google). Data were collected over 1 month, with reminders sent to optimize response rates. All responses were anonymized and compiled for analysis after survey closure.

Statistical analysis

During data analysis, categorical variables were presented as frequencies and percentages, whereas priority ranking data were summarized as mean priority ranks with standard deviations. Differences in rankings were assessed using Friedman test, and Kendall coefficient of concordance (W) was calculated to evaluate the degree of agreement among respondents. All statistical analyses were performed using R ver. 4.1.0 (R Foundation for Statistical Computing). A p-value of less than 0.05 was considered statistically significant.

Results

Physician characteristics

A total of 32 physicians participated in the survey. The largest age group was 40–49 years (n = 13, 40.6%), followed by those aged ≤39 years (n = 7, 21.9%), 50–59 years (n = 7, 21.9%), and 60–69 years (n = 5, 15.6%). Female physicians accounted for 17 respondents (53.1%). Regarding clinical experience, 13 respondents (40.6%) had been in practice for ≥20 years, 7 respondents (21.9%) for <5 years, and the remaining 12 (37.5%) for 5–19 years. Most respondents were affiliated with tertiary hospitals (n = 22, 68.8%), and 21 (65.6%) were based in Seoul, Gyeonggi-do, or Incheon regions (Table 1).

Table 1. Characteristics of surveyed physicians (n = 32)

Characteristic	No. of responses (%)
Age (yr)	
<40	7 (21.9)
40–49	13 (40.6)
50–59	7 (21.9)
60–69	5 (15.6)
≥70	0 (0)
Sex	
Male	15 (46.9)
Female	17 (53.1)
Years of practice	
<5	7 (21.9)
5–9	3 (9.4)
10–14	6 (18.8)
15–19	3 (9.4)
≥20	13 (40.6)
Hospital type	
Primary	1 (3.1)
Secondary	9 (28.1)
Tertiary	22 (68.8)
Location	
Seoul/Gyeonggi-do/Incheon	21 (65.6)
Other	11 (34.4)

Diagnostic and monitoring approaches in clinical practice

The most commonly utilized tools for evaluating TED were the Clinical Activity Score (CAS) and the EUGOGO severity classification, each employed by 28 respondents (87.5%). In contrast, the VISA (vision, inflammation, strabismus, and appearance) classification and the Graves' Ophthalmopathy Quality of Life (GO-QOL) assessment were less frequently used (15.6% and 6.2%, respectively). Monitoring of thyroid-stimulating hormone receptor (TSH-R) antibodies was performed by 30 physicians (93.8%), and 29 (90.6%) considered thyrotropin-binding inhibitory immunoglobulin (TBII) or thyroid-stimulating immunoglobulin (TSI) levels when determining surgical timing. Specifically, 18 (56.2%) evaluated both TBII and TSI, whereas 5 (15.6%) assessed only TBII and 6 (18.8%) assessed only TSI. Furthermore, 14 (43.8%) recommended total thyroidectomy for patients with persistently elevated TSH-R antibody levels. Regarding imaging, contrast-enhanced computed tomography (CT; n = 14, 43.8%) and noncontrast CT (n = 13, 40.6%) were most commonly preferred, followed by magnetic resonance imaging (n = 4, 12.5%). Various diplopia assessment tools were employed, with the Hess test (n = 19, 59.4%), Lancaster test (n = 15, 46.9%), and binocular single vision test (n = 13, 40.6%) being the most frequently used (Table 2).

Table 2. Diagnostic and monitoring approaches for TED in the outpatient setting (n = 32)

Evaluation tool	No. of responses (%)
TED evaluation tool	
CAS	
Yes	28 (87.5)
No	4 (12.5)
VISA classification	
Yes	5 (15.6)
No	27 (84.4)
EUGOGO severity	
Yes	28 (87.5)
No	4 (12.5)
GO-QOL questionnaire	
Yes	2 (6.2)
No	30 (93.8)
TSH-R	
TSH-R antibody monitoring	
Yes	30 (93.8)
No	2 (6.2)
Consideration of TBII or TSI levels to determine decompression timing	29 (90.6)
Only TBII	5 (15.6)
Only TSI	6 (18.8)
Both TBII and TSI	18 (56.3)
TT recommendation in cases of persistently high TSH-R antibody levels	14 (43.8)
Preferred imaging modality	
Noncontrast CT	13 (40.6)
Contrast-enhanced CT	14 (43.8)
Magnetic resonance imaging	4 (12.5)
None	1 (3.1)
Diplopia test (multiple selection)	
Gorman score	7 (21.9)
Hess test	19 (59.4)
Lancaster test	15 (46.9)
Binocular single vision test	13 (40.6)
Light reflex test	6 (18.8)
Prism cover test	3 (9.4)

TED = thyroid eye disease; CAS = Clinical Activity Score; VISA = vision, inflammation, strabismus, and appearance; EUGOGO = European Group on Graves' Orbitopathy; GO-QOL = Graves' Ophthalmopathy Quality of Life; TSH-R = thyroid-stimulating hormone receptor; TBII = thyrotropin-binding inhibitory immunoglobulin; TSI = thyroid-stimulating immunoglobulin; TT = total thyroidectomy; CT = computed tomography.

Medical treatment patterns

For mild, active TED, 29 physicians (90.6%) recommended selenium supplementation, and 26 (81.2%) utilized subconjunctival or eyelid triamcinolone injections, with most (18 of 26, 69.2%) limiting the number of injections to 3.

Table 3. Medical treatment patterns for TED (n = 32)

Clinical management	No. of responses (%)
Mild, active TED treatment	
Selenium recommendation for mild TED	
Yes	29 (90.6)
No	3 (9.4)
Subconjunctival/eyelid triamcinolone injection	
Yes (maximum no. of triamcinolone injection)	26 (81.2)
2	4 (15.4)
3	18 (69.2)
≥4	4 (15.4)
No	6 (18.8)
Moderate-to-severe active TED treatment	
IV GC pulse according to EUGOGO guidelines (total 4.5 g)	
Yes	31 (96.9)
No	1 (3.1)
IV GC pulse (total 7.5 g in more severe TED)	
Yes	6 (18.8)
No	26 (81.2)
Department administering IV GC	
Ophthalmology department	30 (93.8)
Endocrinology department	2 (6.2)
Oral GC	
Yes	16 (50.0)
First-line treatment for mild, active TED	9 (56.3)
CAS <3 with soft tissue inflammation	8 (50.0)
Steroid tapering after IV GC	14 (87.5)
No	16 (50.0)
Immunosuppressant	
Yes*	13 (40.6)
Mycophenolate mofetil	7 (53.8)
Cyclosporine	2 (15.4)
Methotrexate	6 (46.2)
Azathioprine	2 (15.4)
No	19 (59.4)
Tocilizumab (off label)	
Yes	2 (6.2)
No	30 (93.8)
Rituximab (off label)	
Yes	1 (3.1)
No	31 (96.9)
Retrobulbar triamcinolone injection	
Yes	2 (6.2)
No	30 (93.8)
Orbital radiotherapy	
Yes*	29 (90.6)
First-line treatment in TED with muscle enlargement	18 (62.1)
When IV GC is ineffective or not feasible	28 (96.6)
No	3 (9.4)

TED = thyroid eye disease; IV = intravenous; GC = glucocorticoid; EUGOGO = European Group on Graves' Orbitopathy; CAS = Clinical Activity Score.
*The subtotal exceed the total because multiple responses were allowed.

Retrobulbar triamcinolone injections were used by two respondents (6.2%). For moderate-to-severe active TED, 31 respondents (96.9%) administered IV GC pulse therapy following EUGOGO guidelines (total dose of 4.5 g), whereas 6 (18.8%) escalated the dose to 7.5 g in more severe cases. IV GC was predominantly administered by ophthalmologists (n = 30, 93.8%). Oral GCs were prescribed by 16 respondents (50.0%). Among them, 14 (87.5%) used GCs for tapering after IV GC therapy; 9 (56.3%) used them as a first-line treatment for mild, active TED; and 8 (50.0%) used them for patients with CAS <3 but with significant soft tissue inflammation. Immunosuppressants were prescribed by 13 (40.6%), with mycophenolate mofetil (7 of 13, 53.8%) and methotrexate (6 of 13, 46.2%) being the most commonly selected agents. Off-label use of tocilizumab (n = 2, 6.2%) and rituximab (n = 1, 3.1%) was infrequent. Orbital radiotherapy was recommended by 29 (90.6%), most commonly when IV GC was ineffective or not feasible (n = 28, 96.6%) or as a first-line treatment in cases with extraocular muscle enlargement (n = 18, 62.1%) (Table 3).

Surgical treatment patterns

Regarding surgical management, 23 respondents (71.9%) performed orbital decompression, 27 (84.4%) performed eyelid retraction surgery, and 10 (31.3%) performed strabismus surgery. Blepharoplasty was also frequently conducted (n = 28, 87.5%) (Supplementary Table 1).

Management of DON

In managing DON, 13 physicians (40.6%) administered IV GC therapy alone following the EUGOGO guidelines, whereas 19 (59.4%) combined IV GC therapy with orbital radiotherapy as part of first-line management. If no improvement was observed 2 weeks after a 3-day IV GC course, 29 (90.6%) proceeded with orbital decompression (Table 4). In assessing treatment response, visual acuity (mean rank, 1.88 ± 1.14) and relative afferent pupillary defect (mean rank, 2.63 ± 1.43) were ranked as the highest priorities, followed by color vision (mean rank, 3.38 ± 1.56) and visual field testing (mean rank, 3.47 ± 1.41). Structural indicators, such as apex crowding on CT (mean rank, 4.34 ± 1.53) and optic disc swelling (mean rank, 4.81 ± 1.51), were given lower priority. Friedman test revealed a statistically significant difference among the rankings of the six clinical indicators (χ^2 = 133.15, p < 0.001), and Kendall W was 0.332 (p < 0.001), indicating a moderate level of agreement among respondents (Table 5).

Table 4. Clinical management strategies for dysthyroid optic neuropathy (n = 32)

Clinical management	No. of responses (%)
IV GC according to EUGOGO guidelines	13 (40.6)
IV GC + orbital radiotherapy as first-line treatment	19 (59.4)
Decompression recommendation for nonresponders 2 wk after a 3-day IV GC treatment	29 (90.6)

IV = intravenous; GC = glucocorticoid; EUGOGO = European Group on Graves' Orbitopathy.

Table 5. Treatment response indicators for dysthyroid optic neuropathy

Indicator	Priority rank	Friedman test	Kendall W
Visual acuity	1.88 ± 1.14	133.15*	0.332*
Relative afferent pupillary defect	2.63 ± 1.43		
Color vision	3.38 ± 1.56		
Visual field testing	3.47 ± 1.41		
Apex crowding on CT	4.34 ± 1.53		
Optic disc swelling	4.81 ± 1.51		

Values are presented as mean ± standard deviation.
CT = computed tomography.
*Statistically significant (p < 0.001).

Table 6. Preferences for teprotumumab use in TED across clinical scenarios

Clinical scenario	Priority rank	Freidman test	Kendall W
Active TED, CAS = 4, poor response to IV GC → second-line therapy	2.09 ± 0.73	49.31*	0.201*
Active TED, CAS = 4 → first-line therapy	2.13 ± 0.89		
Active TED, CAS = 4, poor response to IV GC + radiotherapy → second-line therapy	2.28 ± 0.91		
Inactive TED, mild proptosis (21–22 mm) → first-line therapy	3.31 ± 0.97		

Values are presented as mean ± standard deviation.
TED = thyroid eye disease; CAS = Clinical Activity Score; IV = intravenous; GC = glucocorticoid.
*Statistically significant ($p < 0.001$).

Therapeutic considerations for teprotumumab

Physicians assigned generally similar priority levels to various clinical scenarios for teprotumumab use. The mean priority ranks were 2.09 ± 0.73 for active TED with poor response to IV GC therapy, 2.13 ± 0.89 for active TED as first-line therapy, 2.28 ± 0.91 for active TED with poor response to both IV GC and radiotherapy, and 3.31 ± 0.97 for inactive TED with mild proptosis (21–22 mm). Friedman test revealed a statistically significant difference among the rankings of the four clinical scenarios (χ^2 = 49.31, $p < 0.001$). Kendall coefficient of concordance indicated a fair level of interrater agreement (W = 0.201, $p <$ 0.001) (Table 6).

Discussion

This nationwide survey revealed a high degree of adherence to international guidelines among South Korean oculoplastic specialists in the diagnosis and treatment of TED. Most respondents routinely employed CAS and the EUGOGO severity classification, with IV GC pulse therapy being the predominant first-line treatment for moderate-to-severe, active TED. Additionally, local triamcinolone injections and selenium were widely used for mild cases. Although immunosuppressants and biologics such as tocilizumab and rituximab were used less frequently, orbital radiotherapy and surgical interventions were commonly integrated into treatment strategies. These findings provide a comprehensive overview of current clinical practice patterns and therapeutic preferences in South Korea.

The widespread adoption of CAS and EUGOGO severity classification (both reported by 28 respondents, 87.5%) reflects a strong consensus on the value of standardized assessment tools in clinical practice [7]. However, the limited use of the VISA classification and GO-QOL assessment suggests an opportunity to more broadly incorporate patient-centered outcome measures, including quality-of-life measures and functional assessments, in routine care [8,9].

Serological testing for TSH-R antibodies was performed by nearly all respondents (93.8%), with 29 (90.6%) incorporating TBII or TSI levels into surgical decision-making. This underscores the growing recognition of these markers not only for diagnosis but also for determining the timing of orbital decompression surgery [10]. Additionally, 14 physicians (43.8%) considered total thyroidectomy in cases with persistently elevated antibody levels, suggesting a trend toward more proactive thyroid ablation strategies in refractory cases. Regarding imaging, both contrast-enhanced and noncontrast CT were commonly preferred, consistent with their diagnostic utility in assessing extraocular muscle involvement and orbital apex crowding [11].

The medical treatment patterns observed in this study largely adhere to international guidelines. For moderate-to-severe active TED, 31 respondents (96.9%) administered IV GC pulse therapy following the EUGOGO regimen (4.5 g cumulative dose). Notably, nearly one-fifth (n = 6) escalated the dose to 7.5 g in severe cases, consistent with recent EUGOGO recommendations [4]. Oral GCs were frequently used as either adjunctive therapy or as first-line treatment in milder cases, demonstrating flexibility in real-world clinical practice.

The widespread use of local triamcinolone (n = 26, 81.2%) for mild TED aligns with existing evidence supporting its efficacy and safety [12,13]. However, the relatively low uptake of immunosuppressants (n = 13, 40.6%) and the limited use of off-label agents such as tocilizumab (n = 2, 6.2%) and rituximab (n = 1, 3.1%) likely reflects limited access, reimbursement challenges, and the absence

of clear consensus on their use in South Korea, despite increasing evidence supporting their benefit in steroid-refractory TED [14–18].

In managing DON, 19 respondents (59.4%) used a combination of IV GC and orbital radiotherapy as first-line therapy. This dual-modality approach is supported by evidence indicating improved outcomes with combination therapy in compressive optic neuropathy [19]. Most physicians (n = 29, 90.6%) proceeded to orbital decompression within 2 weeks for nonresponders, indicating timely escalation of care in accordance with EUGOGO guidelines [20,21].

Functional indicators such as visual acuity (mean rank, 1.88 ± 1.14) and relative afferent pupillary defect (mean rank, 2.63 ± 1.43) were prioritized over structural markers such as CT-detected apex crowding (mean rank, 4.34 ± 1.53) and optic disc swelling (mean rank, 4.81 ± 1.51) for evaluating treatment response. The statistically significant difference in rankings ($\chi^2 = 133.15$, $p < 0.001$) and moderate agreement among respondents (Kendall W = 0.332) suggest that while functional indicators are generally prioritized in assessing treatment response in DON, clinical variability persists. These results highlight the need for standardized assessment criteria that integrate both functional and structural measures.

Several South Korea-specific practice patterns were notable. First, serologic evaluations were actively utilized. Thirty respondents (93.8%) monitored TSH-R antibodies and 29 (90.6%) considered TBII or TSI levels when determining surgical timing. Eighteen respondents (56.3%) performed both TBII and TSI testing, which is substantially higher than the 21% reported in the recent international survey [22]. Second, imaging modalities were actively utilized. Thirty-one respondents (96.9%) employed at least one imaging modality for evaluation of TED. Third, dual-modality therapy with IV GC and orbital radiotherapy was frequently adopted as first-line treatment for DON (n = 19, 59.4%), whereas international guidelines indicate that radiotherapy is generally regarded as an adjunctive option [5].

Regarding teprotumumab, physicians predominantly prioritized its use for patients with active TED, particularly when conventional medical therapies such as IV GC had failed to yield sufficient clinical improvement. Notably, its preference as a first-line therapy in active TED was comparable to its use as a second-line option, indicating growing confidence in its efficacy even in early stages of intervention. In contrast, teprotumumab was deprioritized for inactive TED with mild proptosis, reflecting a more cautious stance when the expected benefits may not outweigh the potential risks.

The statistically significant difference in the prioritization of teprotumumab use across clinical scenarios ($\chi^2 = 49.31$, $p < 0.001$) indicates that physicians' preferences are influenced by clinical context, particularly in relation to disease activity and prior treatment response. However, the relatively lower Kendall coefficient of concordance (W = 0.201) indicates only fair interrater agreement, highlighting variability in clinical decision-making regarding the optimal use of teprotumumab. This variation may be attributed to limited clinical experience with the drug in South Korea, uncertainty regarding cost-effectiveness, and the absence of local guidelines incorporating biologic therapies. As access to teprotumumab increases, establishing clearer consensus criteria may help promote consistent and evidence-based use in clinical practice.

Although teprotumumab has demonstrated clinical efficacy in randomized trials, potential adverse effects such as hearing loss (approximately 10%), hyperglycemia (approximately 10%), and other systemic symptoms raise concerns regarding its safety profile [23–26]. Additionally, its high cost, approximately US $360,000 per treatment course in the United States, poses a major barrier [5]. In South Korea, where teprotumumab is not yet reimbursed, the exact cost remains unknown but is expected to be similarly high given its international valuation.

In contrast, IV GC therapy is widely accessible and inexpensive in South Korea, costing approximately US $10 to $50 per infusion. Decompression surgery also costs approximately US $1,500 to $2,000 per eye, rendering both options more viable in current clinical settings. However, conventional treatments such as IV GC or radiotherapy have limited effect on proptosis, and many patients ultimately require orbital decompression to address disfiguring or functionally significant proptosis. Although decompression is relatively affordable in Korea, it remains a technically demanding and invasive procedure, associated with postoperative pain and potential complications. Notably, the 2022 ATA/ETA consensus guidelines recognize teprotumumab as the only medical therapy with proven efficacy in reducing proptosis [5]. Recent reports have also demonstrated a significant decrease in decompression sur-

geries following teprotumumab treatment [27,28]. Given its demonstrated ability to significantly reduce proptosis and potentially eliminate the need for surgery, teprotumumab may see broader indications in the future as clinicians increasingly weigh its high cost against its capacity to provide noninvasive, transformative outcomes.

Recent international surveys have revealed regional variations in TED management. Brito et al. [29] reported more frequent use of selenium in Europe and a preference for teprotumumab in North America. In China, Chen et al. [30] observed a strong reliance on corticosteroids, with limited access to biologics and multidisciplinary care. Similarly, a recent global survey by Villagelin et al. [22] revealed concentrated teprotumumab use in North America, whereas GCs remained the mainstay elsewhere. Our national survey revealed similar clinical trends, particularly the prioritization of IV GC and limited use of biologics, likely reflecting comparable barriers related to access, cost, and insurance coverage. Collectively, these findings emphasize the need to develop standardized, region-specific treatment algorithms that integrate both evidence-based guidelines and real-world constraints.

This study has certain limitations. First, the sample size was relatively small (n = 32), although it represented a significant portion of actively practicing oculoplastic surgeons in South Korea. Second, given that the survey relied on self-reported data, it may be subject to recall or response bias. Third, the findings reflect the perspectives of oculoplastic surgeons and may not be generalizable to endocrinologists or general ophthalmologists who also treat TED.

In conclusion, this nationwide survey demonstrates substantial adherence to international guidelines among Korean oculoplastic specialists in managing TED. Furthermore, although CAS scoring, EUGOGO classification, and IV GC therapy are widely utilized, variability exists in the use of immunosuppressants, radiotherapy, and biologics. These insights underscore the need for South Korea-specific clinical guidelines that reflect both global standards and local realities. Future research should explore long-term outcomes, cost-effectiveness, and broader multidisciplinary perspectives to guide optimal, patient-centered care.

Conflicts of Interest: None.
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Supplementary Materials

Supplementary Material 1. Thyroid eye disease survey questionnaire.
Supplementary Table 1. Surgical treatment patterns for thyroid eye disease (n = 32)
Supplementary materials are available from https://doi.org/10.3341/kjo.2025.0108.

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Supplementary Material 1. Thyroid eye disease survey questionnaire.

1. What is your age?
   1) 20–29 yr
   2) 30–39 yr
   3) 40–49 yr
   4) 50–59 yr
   5) 60–69 yr
   6) ≥70 yr
2. What is your sex?
   1) Male
   2) Female
3. As a specialist in oculoplastic surgery, how many years of experience do you have in treating thyroid eye disease (TED)?
   1) <5 yr
   2) 5–9 yr
   3) 10–14 yr
   4) 15–19 yr
   5) ≥20 yr
4. What type of medical institution are you affiliated with?
   1) Primary (clinic)
   2) Secondary (hospital, general hospital)
   3) Tertiary (tertiary general hospital)
5. Where is your medical institution located?
   1) Seoul
   2) Gyeonggi-do, Incheon
   3) Other
6. Which surgeries do you perform for patients with TED? (Multiple selections allowed)
   1) Orbital decompression
   2) Strabismus surgery
   3) Lid retraction surgery
   4) Blepharoplasty
   5) None
7. What imaging modality do you most commonly use for patients with TED?
   1) Magnetic resonance imaging (MRI)
   2) Noncontrast computed tomography (CT)
   3) Conrast CT
   4) None
8. Which tests do you primarily use to evaluate strabismus and diplopia in TED patients? (Multiple selections allowed)
   1) Gorman score
   2) Hess test
   3) Lancaster test
   4) Binocular single vision (BSV) test
   5) Light reflex test
   6) Other ( )

9. In your institution, when is medical treatment usually initiated for new TED patients in the active moderate-to-severe phase?
   1) On the same day
   2) Within 1 to 7 days
   3) Within 8 to 14 days
   4) Within 15 days to 1 month
   5) After 1 month
   6) Systemic treatment is not initiated, and the patient is referred to another institution
10. Is endocrinology consultation available within your institution for co-management of TED patients?
   1) Yes
   2) No
11. Which version of the European Group on Graves' Orbitopathy (EUGOGO) guidelines (2016, 2021, 2022 European Thyroid Association [ETA]/American Thyroid Association [ATA] consensus) most closely reflects your current treatment protocol?
   1) EUGOGO 2016
   2) EUGOGO 2021
   3) EUGOGO-ATA-ETA 2022 consensus
12. Do you use the 7-point Clinical Activity Score (CAS) to assess disease activity?
   1) Yes
   2) No
13. Do you use the VISA (vision, inflammation, strabismus, and appearance) classification system?
   1) Yes
   2) No
14. Do you evaluate TED severity using the EUGOGO classification (mild, moderate-to-severe, very severe)?
   1) Yes
   2) No
15. Do you assess quality of life using the Graves' Ophthalmopathy Quality of Life (GO-QOL) questionnaire in your outpatient clinic?
   1) Yes
   2) No
16. Do you check thyroid-stimulating hormone receptor (TSH-R) antibody levels during outpatient follow-up visits?
   1) Yes
   2) No
17. Do you recommend selenium for patients with mild TED?
   1) Yes
   2) No
18. In cases of mild TED with eyelid edema or retraction, do you administer subconjunctival or eyelid triamcinolone injections?
   1) Yes
   2) No
19. What is the maximum number of injections you typically administer?
20. For moderate-to-severe TED, do you prescribe intravenous (IV) Solu-Medrol 500 mg/wk for 6 weeks followed by 250 mg/wk for another 6 weeks?
   1) Yes
   2) No

21. Which department administers steroid injections in your hospital?
    1) Ophthalmology department
    2) Endocrinology department
    3) Other
22. Do you prescribe immunosuppressive agents other than steroids?
    1) Yes
    2) No
23. Which immunosuppressants do you prescribe? (Multiple selections allowed)
    1) Cellcept
    2) Cyclosporin
    3) Methotrexate
    4) Azathioprine
24. Mycophenolate mofetil (Cellcept), recommended as first-line in the EUGOGO guideline, is off-label in Korea. Have you obtained approval through your hospital's review board and the Korean Ministry of Food and Drug Safety?
    1) Yes
    2) No
25. Is orbital radiation therapy available at your hospital?
    1) Yes
    2) No
26. What is your method of orbital radiation therapy?
    1) Used alone as first-line treatment without IV glucocorticoids (yes/no)
    2) Used together with IV glucocorticoids as first-line treatment (yes/no)
    3) Used as second-line treatment due to poor response or intolerance to IV glucocorticoids (yes/no)
29. The EUGOGO guideline recommends IV methylprednisolone 0.75 g/wk × 6 weeks, then 0.5 g/wk × 6 weeks for severe TED. Do you follow this protocol?
    1) Yes
    2) No
30. Do you use tocilizumab off label?
    1) Yes
    2) No
31. Do you use rituximab off label?
    1) Yes
    2) No
32. Do you use oral glucocorticoids for the treatment of TED?
    1) Yes
    2) No
33. In which of the following situations do you use oral glucocorticoids?
    1) After completing all IV glucocorticoid (GC) courses (yes/no)
    2) As tapering/maintenance following IVGC in selected cases (yes/no)
    3) As first-line treatment for moderate-to-severe active TED (yes/no)
    4) As first-line treatment for mild active TED (yes/no)
    5) CAS <3 but soft tissue inflammation is significant (yes/no)
38. Do you perform retrobulbar triamcinolone injections?
    1) Yes
    2) No

39. What is your IV GC treatment protocol for dysthyroid optic neuropathy (DON)?
   1) IV GC according to EUGOGO protocol
   2) 1) + Orbital radiotherapy as a first-line treatment
   3) Other ( )
40. The EUGOGO guideline recommends urgent decompression if there is no improvement 2 weeks after high-dose steroid injection for DON. Do you follow this guideline?
   1) Yes
   2) No
41. Among the following, please rank the most important factors for evaluating treatment response in suspected DON patients at follow-up (from first to sixth priority):
   1) Visual acuity
   2) Visual field
   3) Relative afferent pupillary defect (RAPD)
   4) Color vision
   5) CT evidence of apex crowding
   6) Disc swelling
42. In inactive TED, when planning orbital decompression for proptosis, do you consider the levels of thyrotropin-binding inhibitory immunoglobulin (TBII; normal, <1.75 IU/L) and thyroid-stimulating immunoglobulin (TSI; specimen to reference ratio [SRR]%; normal, <1.3 index or <140%)? (e.g., postpone surgery if elevated)
   1) Only TBII is considered
   2) Only TSI is considered
   3) Both are considered
   4) Neither is considered
43. In patients with persistently high TSH-R antibody levels and moderate-to-severe TED over several years, do you recommend referral to endocrine surgery for total thyroidectomy?
   1) Yes
   2) No
44. Tepezza was approved by the US Food and Drug Administration (FDA) in 2020 as a first-line drug for TED and may become available in South Korea. Assuming the patient understands and consents to the cost and potential side effects (e.g., hearing loss, limb weakness, hyperglycemia), for which patient profiles would you prioritize its use?
   1) As a first-line treatment in patients with CAS ≥4, moderate-to-severe, active TED.
   2) As a second-line treatment in patients with CAS ≥4, moderate-to-severe, active TED who show inadequate response to high-dose IV GC (4.5–7.5g).
   3) As a second-line treatment in patients with CAS ≥4, moderate-to-severe, active TED who show inadequate response to high-dose IV GC (4.5–7.5g) and orbital radiotherapy.
   4) As an alternative to decompression surgery in inactive patients with severe proptosis that significantly reduces quality of life.

Supplementary Table 1. Surgical treatment patterns for thyroid eye disease (n = 32)

Type of surgery (multiple selection)	No. of responses (%)
Orbital wall decompression	23 (71.9)
Strabismus surgery	10 (31.3)
Eyelid retraction surgery	27 (84.4)
Blepharoplasty	28 (87.5)
None	4 (12.5)