Neuroendocrinology Letters Volume 42 No. 7 2021
ISSN: 0172-780X; ISSN-L: 0172-780X; Electronic/Online ISSN: 2354-4716
Web of Knowledge / Web of Science: Neuroendocrinol Lett
Pub Med / Medline: Neuro Endocrinol Lett

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).
No permission to resale without signed publisher agreement.

CASE REPORT

Transient myopia as rare condition after neurosurgery

Kristina Horkovicova[1], Milan Liska[2], Paulina Plesnikova[1], Zuzana Pridavkova[1], Alena Furdova[1]

1 Department of Ophthalmology, Faculty of Medicine, Comenius University and University Hospital, Bratislava, Slovakia
2 Department of Neurosurgery, University Hospital Bratislava, Slovakia

Correspondence to: Prof. Alena Furdova, MD., PhD., MPH
Dept. Ophthalmology, Faculty of Medicine, Comenius University, Ruzinovska 6, 821 06 Bratislava, Slovak Republic
tel: +421-248234607, e-mail: alikafurdova@gmail.com

Submitted: 2021-04-29 Accepted: 2021-08-30 Published online: 2021-08-30

Key words: **transient myopia; neurosurgery; diffuse anaplastic glioma grading III; neuroophtalmology**

Neuroendocrinol Lett 2021; **42**(7):484–488 **PMID:** 35490358 NEL420821A14 © 2021 Neuroendocrinology Letters • **www.nel.edu**

Abstract

Refractive changes may be caused by systemic diseases such as diabetes mellitus, lupus erythematosus, or hypothyroidism. However, refractive changes following the removal of a brain tumour have not been reported. In our case report, we describe a young woman without any systemic disease. She came to the emergency department in our hospital, where she reported a headache on admission and no other difficulties. Vital computer tomography was performed at the emergency outpatient clinic. The frontoparietal round hypodense lesion with an indicated dense margin – suspicious abscess, was detected. The patient was admitted to the Neurological Department of Slovak Medical University to have her condition diagnosed. After magnetic resonance, she was admitted to the Neurosurgery department, she underwent a neurosurgical procedure, where the diffuse anaplastic glioma grade II was histopathologically confirmed. Afterward, she reported worsening of vision. We diagnosed transient myopia, which is a rare condition. One month after the procedure the patient's eyes were again emmetropic without any harm on eyes.

Abbreviations:

MRI	- magnetic resonance imaging
l.dx.	- lateris dextri
l.sin.	- lateris sinister
WHO	- World health organization
OCT	- optical coherence tomography
NITM	- nearwork-initiated transient nearsightedness
TSH	- thyrotropin

INTRODUCTION

The refractive change of the eye is affected by a combination of axial length, corneal diopter, anterior chamber depth, and lens diopter. In general, the fracture changes with age. It has been found that the axial length and diopter of the lens affect the refractive error mostly in adults over the age of 50 years (Hashemi *et al.* 2010; Iribarren *et al.* 2012).

Refractive changes are often described in systemic diseases such as lupus erythematosus (Shu *et al.* 1992), hypothyreosis (Chandrasekaran *et al.* 2006), tumour in orbit, diabetes mellitus (DM), or pregnancy. The pathological occurrence of refractive changes can be caused by two causes. The first is a change in lens thickness due to an abnormal metabolic process. The second is a change in the shape of the eyeball caused by an increase in orbit content (Eva *et al.* 1982; Friberg & Grove 1983; Saito *et al.* 1993; Okamoto *et al.* 2000; Wiemer *et al.* 2008b a).

CASE REPORT

The patient, a 32-year-old woman, was so far untreated for systemic diseases. On October 25, 2020, as she was using her phone, she seemed to have completely lost her mind, she could not say anything. She got a cramp in her mouth and both upper limbs. She lost consciousness and shook her limbs with clenched fists. It took a few minutes and then she took over. She reported a headache on admission and no other difficulties. Previously, on October 22, 2020, she had a short-term state of disorientation.

Vital computer tomography of the brain was performed via the urgent outpatient pathway. A frontoparietal round hypodense lesion was found with an indicated dense margin – suspicious abscess bearing. The patient was admitted to the Neurological Department of Slovak Medical University to diagnose the condition. Consent to publish this paper was obtained from the patient and she gave informed content in our hospital. An objective finding at admission was without neurotopic symptomatology. The magnetic resonance (MR) of the brain was realized. The finding of a highly suspicious solitary deposit in the right frontal lobe was cortically intervening in the white matter – in differential diagnosis glial tumour with malignant signalling characteristics or another type of intraaxial tumorous expansion (Figure 1).

Subsequently, a neurosurgical council was called. It was recommended to supplement the functional MR of the brain and MR tractography. Result of functional MR examination Patient with intraaxial frontal lesion on the right, the patient is right-handed. Motor of the right upper limb: activation of the gyrus precentralis et postcentralis l. sin. at a safe distance from the lesion. Motor of the left upper limb - activation is present during the gyrus precentralis et postcentralis l. dx. In the cortical activation is located at a distance less than safe distance (below 10 mm) dorsally from the tumour frontally to the right. Motor of the right lower limb - activation of the parasagittal part of the gyrus precentralis et postcentralis l. sin. with a slight shift to the level of the midline, said changes are at a safe distance from the bearing frontally to the right. Motor of the left lower limb - activation of the parasagittal part of the gyrus precentralis et postcentralis l. dx. at a safe distance from the lesion frontally to the right. Speech fluency test - hemispheric dominance is left. The SMA frontal parasagittal is displayed on left side at a safe distance from the lesion. The Brocka area in the gyrus frontalis inferior l. sin. at a safe distance from the lesion in the right hemisphere. Expected activation of temporal lat. sin. is not observed in the place of the supposed Wernicke area, the occipital activation was on left side. In the speech fluency test, both cortical activation and frontal activation were shown in the immediate vicinity of the tumour.

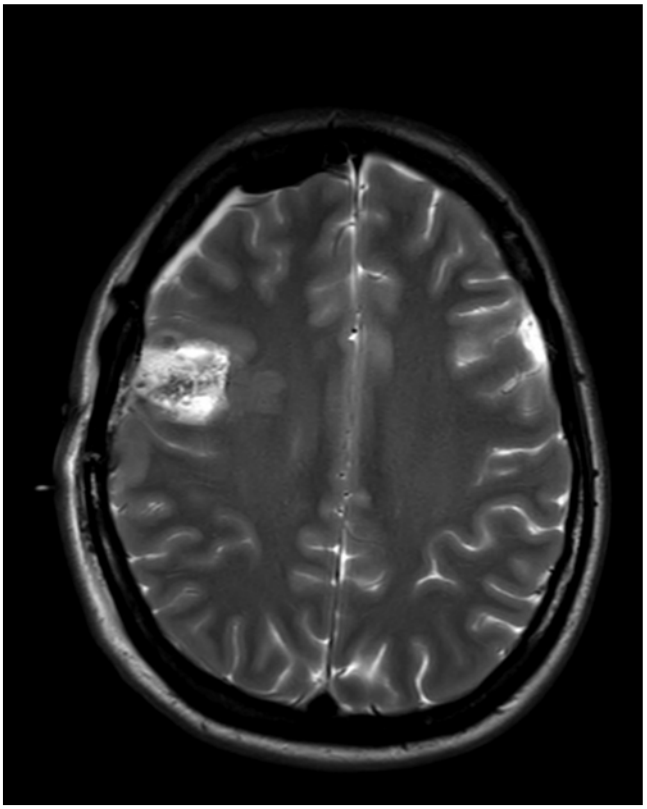

Fig. 1. Magnetic resonance tumorous mass finding

Brain MR – tractography was performed. The reconstruction of white matter pathways in the right hemisphere was performed in a right-handed patient with a tumorous frontal lesion on the right. Fasciculus arcuatus is located near the tumor mass - 10 mm. The other pathways are located at a safe distance from the tumorous frontal lesion on the right. After completing MR examination, the neurosurgeon recommended transferring the patient to the Neurosurgery Department.

The electroencephalography examination was supplemented. The presence of an abnormal graph with a non-specifically localized frontocentroparietal electrogenesis disorder bilaterally to the left were recorded, as well as with atypical bilateral synchronous epileptiform discharges to the left. The background activity was irregular, with a reactivity disorder. During hospitalization, the patient experienced a seizure of tonic-clonic seizures lasting several seconds. It was administered intravenous diazepam and levetiracetam treatment. Dexamethasone, omeprazole and fraxiparine were also temporarily administered. On November 4, 2020, the patient underwent neurosurgical resection of an intracranial tumour through right-frontal craniotomy microsurgically with neuronavigation and intraoperative neuromonitoring. After the operation, the patient began to have a speech problem and vision problems with diplopia. The patient was subsequently examined at the Department of Ophthalmology, Faculty of Medicine, Comenius University and University hospital Bratislava on November 8, 2020. The vision before operation was 20/20. She had never worn glasses before. During examination, the patient had a central

Fig. 2. Magnetic resonance of orbit after neurosurgery.

visual acuity of the right eye of 20/80 cc. - 1.5 Dsph 20/20, on the left eye 20/60 cc.- 1.25 Dsph 20/20. Intraocular pressure was bilateral 16 Torr. The anterior segment was without a pathological finding. The pupils responded to a direct and indirect reaction to exposure. The optic nerve target as well as the ocular background was without a pathological finding. A postoperative MR examination of the brain focusing on orbits was recommended but did not prove the cause of new-onset myopia with diplopia (Figure 2).

On November 10, 2020 repeated ophthalmological consultation showed central visual acuity 20/60 with correction - 0.75 Dsph - 0.5 cyl ax 157 20/30, on the left eye 20/40 with correction - 0.75 Dsph 20/25. Automatic refraction was also performed in cycloplegia. The values in the right eye were + 0.25 Dsph - 0.5 cy lax 106, in the left eye + 0.25 Dsph - 0.25 cyl ax 46. Optical coherence tomography (OCT) was also performed. OCT of macula (Figure 3A), OCT of optic nerve head (Figure 3B) and OCT of macula, ganglion cell analysis (Figure3C), were without pathological findings.

The patient was suggested a solution with a temporary eyeglass device. The patient came for a control ophthalmological examination on December 9, 2020. The central visual acuity without correction was 20/25 for the right eye and 20/16 for the left eye. The patient's condition was concluded as transient myopia after neurosurgical brain surgery. The histopathological conclusion was a diffuse anaplastic glioma, WHO grading III frontally to the right. The patient will be further monitored by an oncologist. She will undergo chemotherapy and radiotherapy. She continues to be monitored by an ophthalmologist, neurologist, and neurosurgeon.

DISCUSSION

Not much has been written in the literature about transient myopia after neurosurgical procedures. In our patient, we ruled out the effect of medications that could had been the cause of transient myopia. Magnetic resonance imaging, both functional and tractographic, ruled out the possibility that the tumour was nearby and causing harm to the patient after surgery. Nevertheless, the patient had facial nerve palsy and transient myopia.

So far in the literature, we find transient myopia as the most common cause in near work. Transient myopia can be caused by concomitantly administered drugs like acetazolamide, aripiprazole, topiramate, hydrochlorothiazide, metronidazole. Again and again one encounters in the literature transient myopia in an acute glaucoma attack, when the iridocorneal angle is closed (Edwards 1963; Sen *et al.* 2001; Cumurcu *et al.* 2019).

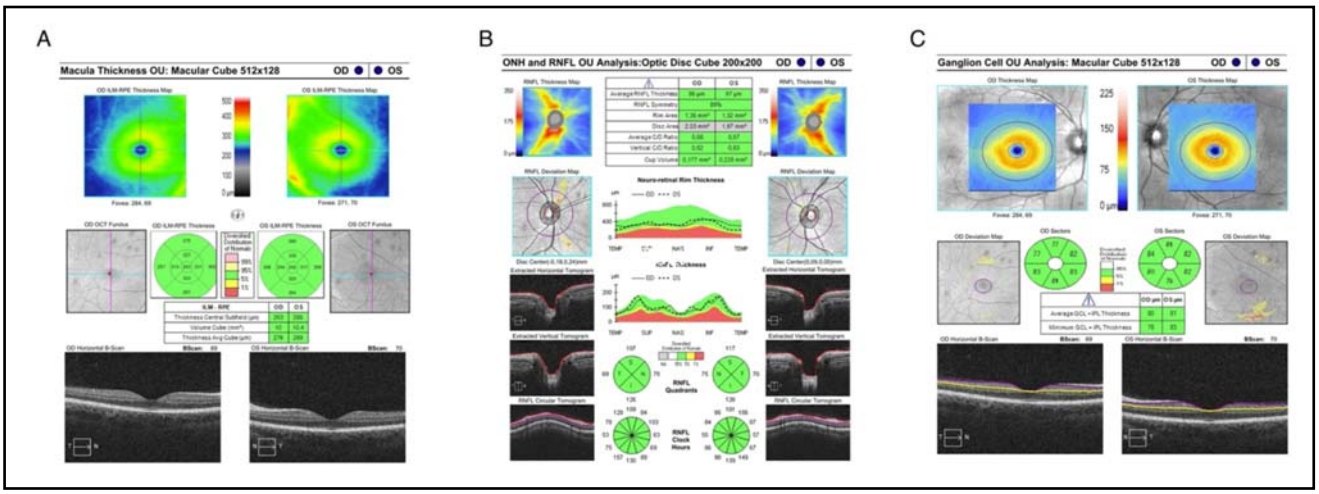

Fig. 3. Optical coherence tomography of the macula of both eyes, B - Optical coherence tomography of optic nerve head both eyes, C - Optical coherence tomography – ganglion cell analysis of both eyes.

Copyright © 2021 Neuroendocrinology Letters ISSN 0172–780X • www.nel.edu

Taking medications that each cause a severe rash with ciliochoroidal emanation is both a common and dangerous consequence. Sulfa medications have been blamed for causing transient myopia, choroidal eruption, ciliary body oedema, and most importantly a rotation of the iris belly of the focal point. Not long ago, topiramate, a commonly used antiepileptic drug, was blamed for causing side-eye formation. Carbonic anhydrase inhibitors, for example, acetazolamide and methazolamide, are efficiently utilized specialists in glaucoma treatment. Surprisingly, there are a few reports of punctate glaucoma with ciliochoroidal emission brought on by acetazolamide and methazolamide (Rhee *et al.* 2001; Craig *et al.* 2004; Lee *et al.* 2007a; Abtahi *et al.* 2012; Kwon *et al.* 2012; Malagola *et al.* 2013). Recently, Vishwakarma *et al.* reported a case of transient myopia and point closure glaucoma after taking mefenamic corrosive (Vishwakarma *et al.* 2009). Lee *et al.* reported a case of severe transient myopia with ciliochoroidal emanation induced by phendimetrazine and ephedrine. (Lee *et al.* 2007b).

Jaruseviciene and Sirvydyte described acute bilateral myopia which was inducted by Triplixan. Triplixan is usually used to treat systemic hypertension. It consist of perindopril arginine, amlodipine and indapamide. The mechanism od myopisation is still not completely understood. Also i tis very important for cardiologist to know about side effect within using Triplixan or one of the thee drugs it contains. (Jaruseviciene & Sirvydyte 2020).

Nearwork-inducted transient myopia (NITM) refers to the small and transient myopic shift in the refractive state of the eye at a distance triggered by a period of supported near work. The near work being possibly the most significant natural myopic factor currently known. NITM reflects an inability of the vitreous focal point to diminish its power appropriately and rapidly. It shows an accommodative and result/hysteresis miracle of physiological root, with subsequent far core interest. The introductory NITM expansion and its red term are the two main boundaries used to represent the accommodative response following aided near work. The underlying NITM extent is characterized as the dioptric contrast between the fast refractive state before and the fast refractive state after a near task. The term "red" or "rotation time" refers to the measure of the time required for this transient accommodative response to return to the pre-task level. Both NITM limits can be affected by refractive collecting. They have both been found to be expanded in myopes compared to emmetropes or hypertropes. Therefore, it was suggested several years ago that the NITM is producing a small and persistent retinal defocus. It may be one of numerous conceivable ecologically-based myopogenic components contributing to permanent myopia. Another factor that may affect NITM limits is the near work term, with NITM emphatically corresponding to near work length (Ong & Ciuffreda 1995; Ciuffreda & Wallis 1998; Ciuffreda & Vasudevan 2008; French *et al.* 2013; Huang *et al.* 2015; Lin *et al.* 2016, 2021).

Patients with multiple sclerosis may likewise have visual sharpness issues as the principal indication of the illness. In cerebrum sicknesses, the neurofilament light chain (NfL) is viewed as a significant marker of neurodegeneration and infection movement and its more elevated levels are related to expanded mind decay. In treated patients with Relapsing-Remitting Multiple Sclerosis, a relationship among NfL and segment, clinical and MR attributes just as mind volume boundaries were examined and NfL and MR volume boundaries are considered as biomarkers of neurodegeneration in Multiple Sclerosis (Filippi *et al.* 2020).

Glioblastomas are treated with either with surgical procedure or additionally with chemotherapy or radiotherapy. In certain examinations they theorized, that ellipticine can act as an inhibitor or inducer of biotransformation catalysts. Consequently tweaking its own digestion prompting its genotoxic and pharmacological impacts (Martinkova *et al.* 2009).

Visual acuity changes as a result of orbital affection or Graves illness. The assurance of danger factors corresponding to hypothyroidism, for example, hereditary inclination and loci hereditary variations is profoundly fundamental. The thyroid dysfunction is a typical issue influencing all population, mainly in female patients. Transient visual disorders are likewise regular in orbital affections with regards to thyroid dysfunction (Abdulla *et al.* 2020).

Thyrotropin (TSH) - emitting pituitary adenomas are uncommon, representing just 0.5 % of every single pituitary tumour. Treatment with lanreotide appears to be compelling in patients who show TSH discharge concealment in the octreotide stacking test. In this patients additionally, visual sharpness issues may show up in the complex of signs at the beginning of the infection (Tokutsu *et al.* 2020).

CONCLUSION

As numerous articles suggest, transient myopia occurs especially in patients by near work. Transient myopia after neurosurgery in a patient could be caused primarily by surgery and secondarily by irritation at the stimulus.

In any case, it is good to consider transient myopia among other diagnoses if the patient complains of impaired vision postoperatively.

Consent to publish was obtained from the patient.

We confirm that the patient provided written, informed consent to publish the case details and images.

DECLARATIONS

Author Contributions

Horkovicova Kristina, formal analysis, investigation, writing—original draft preparation, Liska Milan, formal

analysis, investigation, writing, Plesnikova Paulina, formal analysis, investigation, writing, Pridavkova Zuzana, formal analysis, investigation, writing —original draft preparation Furdova Alena, supervision, resources, investigation, analysis

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Ethics and Consent

The patient provided the authors with written consent to publish details of his case and all accompanying images. No institutional approval was required for the publications of this case.

REFERENCES

1 Abdulla J, Abubaker F & Saber F (2020). Thyroid dysfunction among adults in Bahrain: A hospital-based study. Neuro endocrinology letters. **41**(1).
2 Abtahi M-A, Abtahi S-H, Fazel F, et al. (2012). Topiramate and the vision: a systematic review. Clinical Ophthalmology (Auckland, NZ). **6**: 117.
3 Chandrasekaran S, Petsoglou C, Billson F, Selva D & Ghabrial R (2006). Refractive change in thyroid eye disease (a neglected clinical sign). British journal of ophthalmology. **90**(3): 307–9.
4 Ciuffreda KJ & Vasudevan B (2008). Nearwork-induced transient myopia (NITM) and permanent myopia–is there a link? Ophthalmic and Physiological Optics. **28**(2): 103–14.
5 Ciuffreda KJ & Wallis DM (1998). Myopes show increased susceptibility to nearwork aftereffects. Investigative ophthalmology & visual science. **39**(10): 1797–803.
6 Craig JE, Ong TJ, Louis DL & Wells JM (2004). Mechanism of topiramate-induced acute-onset myopia and angle closure glaucoma. American journal of ophthalmology. **137**(1): 193–5.
7 Cumurcu T, Cumurcu BE, Yesil B & Gunduz A (2019). Aripiprazole-induced transient myopia. North Clin Istanb. **7**(5): 516–8.
8 Edwards TS (1963). Transient myopia due to tetracycline. JAMA. **186**(1): 69–70.
9 Eva PR, Pascoe PT & Vaughan DG (1982). Refractive change in hyperglycaemia: hyperopia, not myopia. British Journal of Ophthalmology. **66**(8): 500–5.
10 Filippi P, Vestenická V, Siarnik P, et al. (2020). Neurofilament light chain and MRI volume parameters as markers of neurodegeneration in multiple sclerosis. Neuro endocrinology letters. **41**(1).
11 French AN, Morgan IG, Mitchell P & Rose KA (2013). Risk factors for incident myopia in Australian schoolchildren: the Sydney adolescent vascular and eye study. Ophthalmology. **120**(10): 2100–8.
12 Friberg TR & Grove AS (1983). Choroidal folds and refractive errors associated with orbital tumors: An analysis. Archives of Ophthalmology. **101**(4): 598–603.
13 Hashemi H, Iribarren R, Morgan IG, Khabazkhoob M, Mohammad K & Fotouhi A (2010). Increased hyperopia with ageing based on cycloplegic refractions in adults: the Tehran Eye Study. British journal of ophthalmology. **94**(1): 20–3.
14 Huang H-M, Chang DS-T & Wu P-C (2015). The association between near work activities and myopia in children—a systematic review and meta-analysis. PloS one. **10**(10): e0140419.
15 Iribarren R, Morgan IG, Nangia V & Jonas JB (2012). Crystalline lens power and refractive error. Investigative ophthalmology & visual science. **53**(2): 543–50.
16 Jaruseviciene R & Sirvydyte G (2020). Acute bilateral myopia induced by Triplixam: a case report. BMC Ophthalmol. **20**(1): 375–375.
17 Kwon SJ, Park DH & Shin JP (2012). Bilateral transient myopia, angle-closure glaucoma, and choroidal detachment induced by methazolamide. Japanese journal of ophthalmology. **56**(5): 515–7.
18 Lee GC, Tam CP, Danesh-Meyer HV, Myers JS & Katz LJ (2007a). Bilateral angle closure glaucoma induced by sulphonamide-derived medications. Clinical & experimental ophthalmology. **35**(1): 55–8.
19 Lee W, Chang JH, Roh KH, Chung J & Ohn YH (2007b). Anorexiant-induced transient myopia after myopic laser in situ keratomileusis. Journal of Cataract & Refractive Surgery. **33**(4): 746–9.
20 Lin Z, Vasudevan B, Liang YB, Zhou HJ & Ciuffreda KJ (2021). The association between nearwork-induced transient myopia and progression of refractive error: A 3-year cohort report from Beijing Myopia Progression Study. Journal of Optometry. **14**(1): 44–9.
21 Lin Z, Vasudevan B, Mao GY, et al. (2016). The influence of near work on myopic refractive change in urban students in Beijing: a three-year follow-up report. Graefe's Archive for Clinical and Experimental Ophthalmology. **254**(11): 2247–55.
22 Malagola R, Giannotti R, Pattavina L & Arrico L (2013). Acute cilio-choroidal effusion due to acetazolamide: unusual posterior involvement (OCT aspects). Eye. **27**(6): 781–2.
23 Martinkova E, Dontenwill M, Frei E & Stiborova M (2009). Cytotoxicity of and DNA adduct formation by ellipticine in human U87MG glioblastoma cancer cells. Neuroendocrinology Letters. **30**(1): 60.
24 Okamoto F, Sone H, Nonoyama T & Hommura S (2000). Refractive changes in diabetic patients during intensive glycaemic control. British journal of ophthalmology. **84**(10): 1097–102.
25 Ong E & Ciuffreda KJ (1995). Nearwork-induced transient myopia. Documenta Ophthalmologica. **91**(1): 57–85.
26 Rhee DJ, Goldberg MJ & Parrish RK (2001). Bilateral angle-closure glaucoma and ciliary body swelling from topiramate. Archives of ophthalmology. **119**(11): 1721–3.
27 Saito Y, Ohmi G, Kinoshita S, et al. (1993). Transient hyperopia with lens swelling at initial therapy in diabetes. British journal of ophthalmology. **77**(3): 145–8.
28 Sen HA, O'Halloran HS & Lee WB (2001). Topiramate-induced acute myopia and retinal striae. Archives of Ophthalmology. **119**(5): 775–7.
29 Shu U, Takeuchi F, Tanimoto K, Moroi Y, Uchida K & Ito K (1992). Transient myopia with severe chemosis associated with exacerbation of disease activity in systemic lupus erythematosus. The Journal of rheumatology. **19**(2): 297–301.
30 Tokutsu A, Okada Y, Torimoto K, et al. (2020). Response of thyrotropin-secreting pituitary tumors to preoperative lanreotide therapy. Report of two cases. Neuro endocrinology letters. **41**(1).
31 Vishwakarma P, Raman GV & Sathyan P (2009). Mefenamic acid-induced bilateral transient myopia, secondary angle closure glaucoma and choroidal detachment. Indian journal of ophthalmology. **57**(5): 398.
32 Wiemer NG, Dubbelman M, Kostense PJ, Ringens PJ & Polak BC (2008a). The influence of diabetes mellitus type 1 and 2 on the thickness, shape, and equivalent refractive index of the human crystalline lens. Ophthalmology. **115**(10): 1679–86.
33 Wiemer NG, Eekhoff EM, Simsek S, et al. (2008b). Refractive properties of the healthy human eye during acute hyperglycemia. Graefe's Archive for Clinical and Experimental Ophthalmology. **246**(7): 993–8.

Copyright © 2021 Neuroendocrinology Letters ISSN 0172–780X • **www.nel.edu**