

Ocular involvement in rheumatic diseases

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Abstract

Rheumatic diseases are associated with a significant decline in quality of life, which is not only related to the progression of the underlying disease but also to the development of coexisting conditions. One of the possible complications in this group of diseases is ocular involvement.

Impaired vision is strongly associated with a significant decline in quality of life and can also exacerbate problems related to physical functioning. Consequently, it can lead to serious complications in the treatment of the underlying disease. Additionally, from a clinical point of view, it is also important to note that ocular diseases may precede the occurrence of inflammatory joint and spinal diseases, as well as organ involvement in systemic connective tissue disorders. Therefore, paying attention to ocular symptoms can help in early diagnosis and thus improve patient prognosis. For the aforementioned reasons, ocular diseases should be carefully considered in routine rheumatologic practice.

Key words: rheumatic diseases, uveitis, ocular manifestations.

Introduction

Rheumatic diseases are often associated with ophthalmic complications. Any part of the eyeball can be affected. The most common conditions include keratoconjunctivitis sicca, uveitis, scleritis and episcleritis, ischaemic retinopathy, optic neuropathy.

Keratoconjunctivitis sicca primarily involves the sense of having a foreign body under the eyelids and a sense of burning; however, photophobia and deterioration of visual acuity can also occur.

The vascular layer of the eye (the uvea) includes the iris, ciliary body and chorioidea. Depending on location, the anterior vascular layer (iritidocyclitis), the intermediate portion (intermediate uveitis) and the posterior one (posterior chorioiditis) can be affected. Depending on the course of inflammation, uveitis can be divided into acute, subacute and chronic. Acute uveitis is characterized by a rapid onset and duration of up to 6 weeks. Chronic uveitis usually has an asymptomatic onset and lasts more than 3 months, sometimes many years [1].

Uveitis occurs at a rate of 38 per 100,000 individuals [2]. It is usually found in young people. In the majority of cases it is diagnosed in patients under the age of forty. Inflammation of the anterior segment of the vascular membrane is the most common form of vascular membrane inflammation (iritidocyclitis is the most common form uveitis). In patients with the presence of the HLA-B27 acute anterior uveitis is usually found which is characterized by eye pain, redness, photophobia, epiphora and progressive deterioration of visual acuity. The palpebral fissure is narrowed, the eye is congested with intensive perilimbal hyperaemia and the pupil is narrow with a weak light reflex. Effusion appears in the anterior chamber.

The presence of the HLA-A29 is a predisposing factor for multifocal chorioiditis [2]. As many as 50% of cases of recurrent anterior uveitis are considered idiopathic since the underlying disease cannot be determined. However, this condition is considered to be the first sign of spondyloarthropathy preceding it by many years [3]. Other causes of anterior uveitis include herpes infection, sarcoidosis, toxoplasmosis, Behçet's syndrome, multi-

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ple sclerosis or tuberculosis. Chronic uveitis with scarce symptoms occurs in children with juvenile idiopathic arthritis (JIA) [3].

Scleritis is associated with strong eyeball pain with associated conjunctiva and sclera redness, epiphora and photophobia. It is found primarily in young and middle-aged women. Nearly half of the cases of scleritis are associated with autoimmune diseases [4]. It is most often found in patients with rheumatoid arthritis (RA), granulomatosis with polyangiitis (GPA, formerly known as Wegener's granulomatosis), spondyloarthropathies (SpA), polyarteritis nodosa (PAN), systemic lupus erythematosus (SLE). Other underlying causes of scleritis include bacterial, viral and parasitic infections. Scleritis can be anterior or posterior. Anterior scleritis occurs in three forms: diffuse (most common), nodular, necrotizing. Posterior scleritis is the least common form of the disease.

In the case of episcleritis the patient complains of a red eye, usually in the palpebral fissure on the nasal side [1, 4].

Vasculitis leads to the development of microinfarcts and ischaemic foci in the retina, which results in vascular oedema and angiogenesis in the retina, vitreous body haemorrhages and fibrosis as well as retinal detachment [1].

Optic neuropathy manifests itself as progressive deterioration of visual acuity, impaired colour vision and impaired pupillary light reflex [1].

Various visual complications are observed in different connective tissue diseases. However, there is a relationship between certain systemic diseases and a higher rate of some eye diseases.

Ocular involvement in rheumatic diseases

Rheumatoid arthritis is a chronic systemic connective tissue disease that affects the lining of the synovial joints, and also involving other organs; RA is usually associated with secondary dry eye syndrome as well as scleritis and episcleritis. The problem of dry eye occurs in 11% to 50% of patients with RA. Scleritis and episcleritis are the second most common ocular manifestation of RA. They can sometimes be prodromal symptoms, but they usually indicate the presence of active disease. Episcleritis occurs in approximately 5% of patients with RA and scleritis is found in 2% of these patients [5].

Retinal vasculitis has also been reported for RA patients. The optic nerve is less commonly affected in RA.

The second most common rheumatic disease and the one which is most commonly associated with visual involvement is Sjögren syndrome (SS). It is 9 times more common in women. It can occur at any age. The peak incidence is at 40 years of age. The dominant ocular symp-

toms are those associated with dry eye syndrome. It is the result of desquamation of corneal epithelium and bulbar conjunctiva. It occurs as a result of insufficient lacrimation and abnormal composition of the tears. Hyperosmolarity of tears is found in these patients. It manifests as eye pruritus, foreign body sensation, burning and pain. Patients can also complain of sunlight hypersensitivity, eye fatigue, redness and fluctuating visual acuity. Symptoms exacerbate as a result of low moisture level, tobacco smoke exposure, anticholinergics or antihistamines.

Complaints develop slowly and are variable, which makes diagnosis difficult. Therefore, it is estimated that the disease remains undiagnosed in half of the affected adult population. Data suggest that diagnosis is delayed by approximately 3.9 years [6–8].

Spondyloarthropathies are often complicated by uveitis. In ankylosing spondylitis (AS) the anterior part of the uvea is most often affected; in psoriatic arthritis (PsA) anterior or posterior uveitis occurs, while in reactive arthritis (ReA) iritis is found.

It is estimated on the basis of the available literature that from 20 to 40% of patients with ankylosing spondylitis have a history of acute anterior uveitis. The posterior part of the uvea is less frequently affected. In patients with psoriatic arthritis uveitis occurred at a rate of approximately 25%. In over 80% of cases uveitis has an acute course and in over 90% the anterior portion of the eye is affected. Bilateral inflammation has been reported in as many as 80% of patients with spondyloarthropathies and recurrent inflammation in approximately 50% [9–11].

In chronic uveitis the following complications can occur, particularly in patients with the HLA-B27: pupillary block with secondary filtration angle closure, visual acuity deterioration, cataract, secondary glaucoma, macular oedema. Prolonged and uncontrolled anterior uveitis is a risk factor for the transfer of inflammation to the posterior portion of the eye [9–11].

Reactive arthritis occurs 1–6 weeks after an infection, usually a genitourinary or gastrointestinal tract infection. The main pathogens include *Chlamydia trachomatis*, *Yersinia*, *Salmonella*, *Shigella* and *Campylobacter*. Following the onset of urinary or gastrointestinal tract infection symptoms articular and ocular complaints occur. Conjunctivitis occurs most frequently and iritis is less common. Conjunctivitis is particularly frequently induced by *Chlamydia* and occurs within the first few days from the infection. It is often painless and non-specific, but can cause burning and irritation of the eyes. It occurs in 2% of patients with acute ReA and in approximately 96% of patients with chronic disease. It is estimated that ReA can become chronic in 30–50% of patients.

Iritis is less common. It affects 10–20% of patients with ReA who have the HLA-B27 [12, 13].

Ocular problems affect approximately 20–30% of patients with SLE. Keratoconjunctivitis sicca is the most common one. Various data indicate that they occur at a rate of 9 to 25% of patients.

In patients with active SLE the retina is often involved (29%) and lesions similar to diabetic or hypertensive microangiopathy frequently occur. The presence of antiphospholipid antibodies is found in the majority of these patients. Scleritis and episcleritis occur in approximately 2.4% of adult patients with SLE [14–17].

Optic nerve involvement is less common. It usually occurs in the form of inflammation or anterior ischemic optic neuropathy. It is associated with serious visual impairment and only early glucocorticosteroids treatment gives a chance for improvement. Ocular vascular thrombosis is a rarely diagnosed but serious eye condition associated with SLE. The consequences of vascular occlusion and the development of collateral circulation include vitreous body hemorrhages, retinal detachment and post-thrombotic glaucoma [14–17].

As a result of the procoagulatory activity of antiphospholipid antibodies associated with antiphospholipid syndrome (APS) thrombosis can be observed in the vessels of various organs, including the eyes. The most common ocular manifestations of APS are those of retinal vascular thrombosis, particularly in young individuals. It is estimated that ocular complications occur in 14–18% of patients.

Abnormalities which may occur in the anterior portion of the eye include telangiectasias, microaneurysms, episcleritis, scleritis and keratitis. The most common ocular manifestation of APS located in the anterior portion of the eye is superficial punctate keratitis. Scleritis occurs in over 45% of patients. Anterior scleritis is most commonly observed. The posterior portion of the eye is involved in as many as 76% of APS patients. Retinal vasculitis, vitreous body inflammation and, less commonly, retinal detachment or posterior keratitis are usually diagnosed.

Antiphospholipid syndrome can also be associated with optic neuropathy, usually unilateral, which can occur in the form of anterior ischaemic optic neuropathy or retrobulbar optic neuritis [18, 19].

To date a few reports of ocular abnormalities in patients with systemic sclerosis (SSc) and a number of studies on small groups of patients have been presented. Dry eye syndrome is the most common ocular complication in SSc. It is the consequence of lacrimal gland fibrosis as well as chronic blepharitis and Meibomian gland dysfunction. Retinopathy and maculopathy are less common. In 29–65% of patients with SSc eyelid

skin sclerosis occurs, which leads to the inability to close the eyelids completely (lagophthalmos) or to the narrowing of the eyelid fissure (blepharophimosis). Cases of blepharitis or degenerative proliferation of bulbar conjunctiva (pterygium) have also been reported. Single cases of recurrent uveitis have been reported. Literature data show that over 30% of patients with SSc develop chorioidal perfusion disorders [16, 20–22].

Multiple muscular and cutaneo-muscular inflammation can be complicated with keratoconjunctivitis sicca, less commonly with retinopathy. Cases of iritis, episcleritis and chorioiditis have also been reported [16, 23, 24].

The antineutrophil cytoplasmic antibody (ANCA)-associated vasculitides (AAV) are a necrotising inflammation of small vessels including primarily interstitial arteries, arterioles, capillaries and venules associated with the presence of antibodies against neutrophil cytoplasm. ANCA-associated vasculitis covers three syndromes: GPA, eosinophilic granulomatosis with polyangiitis (EGPA, formerly known as Churg-Strauss syndrome) and microscopic polyangiitis (MPA). Ocular complications occur in 50–60% of patients in AAV, usually in GPA. It is estimated that 29–52% of GPA patients have ocular complications. The anterior portion of the eye is usually affected, usually by scleritis and less commonly by ulceration or orbital pseudotumour. Lesions in the posterior part of the eye, such as retinal vasculitis or optic neuropathy were less frequently reported [25, 26].

Giant cell arteritis (GCA) is characterised by the presence of inflammatory infiltration and T CD4 cell granulomas, macrophages and multinucleated cells in the walls of large and medium-sized arteries leading to their segmental stenosis and, consequently, tissue ischaemia [27, 28]. Visual impairment occurs in 25–50% of giant cell arteritis patients. The most commonly reported complication is vision loss as a result of optic nerve ischaemia. Uveitis as a manifestation of posterior ciliary artery ischaemia is less common [29, 30].

Takayasu arteritis (TAK) is a chronic inflammation of large vessels particularly of the aorta and its branches, less commonly of other arteries. Ophthalmic symptoms are relatively rare in TAK. As a result of aortic arch branches being affected by the disease, an individual develops ischaemia-related visual impairment. If the disease affects renal arteries, severe, uncontrolled arterial hypertension develops, which leads to visual complications. Takayasu arteritis is usually reported to be associated with retinopathy. Other manifestations such as anterior ischaemic optic neuropathy or central retinal artery occlusion are less commonly reported [29, 30].

Behçet's disease is a chronic disease characterised by periods of exacerbations and remissions. It occurs at a similar rate in women and in men. First symptoms

Table I. Ocular disorders associated with rheumatic disease need urgent ophthalmological consultation [1–34]

Sign and symptoms	Ophthalmologic diagnosis	Rheumatic disease
Sens of burning and foreign body, ichting, photophobia, corneal ulceration	Dry eye	Sjögren's syndrome Rheumatoid arthritis Systemic lupus erythematosus Scleroderma
Pain, redness, photophobia, blurred vision	Uveitis	Ankylosing spondylitis Psoriatic arthritis Reactive arthritis Juvenile idiopathic arthritis Behçet's disease
Deep pain, sclera redness, photophobia epiphora	Scleritis	Rheumatoid arthritis Systemic lupus erythematosus ANCA-related vasculitis Behçet's disease
Decreased vision, pain, photophobia	Keratitis	Sjögren's syndrome Rheumatoid arthritis ANCA-related vasculitis Systemic lupus erythematosus Behçet's disease
Loss of vision	Retinal vasculitis	Systemic lupus erythematosus ANCA-related vasculitis Behçet's disease Sarcoidosis Rheumatoid arthritis
Loss of vision central or peripheral	Optic neuropathy	Giant cell arteritis Systemic lupus erythematosus Antiphospholipid syndrome

occur between 20 and 35 years of age. Behçet's disease is an inflammatory disease of blood vessels. Ophthalmic symptoms occur in as many as 70% of these patients. The conjunctivas, sclera, vitreous body and retina can be involved. Bilateral acute non-granulomatous iritis, often with purulent effusion in the anterior chamber, is usually observed. The disease is chronic and can lead to multiple complications [31, 32].

Juvenile idiopathic arthritis is the most common rheumatic disease of the young age. It is diagnosed up to 16 years of age. In oligoarticular JIA approximately 20% of patients develop uveitis. Even higher rates (up to 85%) are observed in the female population with single-

Table II. Anatomical classification of eye involvement in rheumatic diseases [36–57]

Anatomical classification of eye involvement in rheumatic diseases	Diseases	Prevalence [%]
Uveitis	Ankylosing spondylitis	30–50
	Psoriatic arthritis	7–18
	Juvenile idiopathic arthritis	4–24
	Systemic lupus erythematosus	0.1–4.8
	Granulomatosis with polyangiitis	25–50
	Behçet's disease	50–80
	Sarcoidosis	30–70
Episcleritis	Rheumatoid arthritis	1–3
	Sjögren's syndrome	15
	Behçet's disease	3–40
	Systemic lupus erythematosus	30–70
	Crohn's disease	1–5
Scleritis	Rheumatoid arthritis	1–2
	Behçet's disease	4–24
	Systemic sclerosis	0.4
Optic neuropathy	Systemic lupus erythematosus	< 1
	Eosinophilic granulomatosis with polyangiitis	0.23
	Takayasu's arteritis	5–10
Retinopathy	Systemic lupus erythematosus	10–29
	Ankylosing spondylitis	A rare association
	Eosinophilic granulomatosis with polyangiitis	0.4
Conjunctivitis	Reactive arthritis	
	acute	2
	chronic	96
	Sarcoidosis	40
	Eosinophilic granulomatosis with polyangiitis	7
Involvement of the lacrimal gland	Sarcoidosis	4.2–15.8
	Sjögren's syndrome	50–70

joint disease and the presence of antinuclear antibodies (ANA). The risk factors for uveitis in JIA include female sex, early age of onset, the presence of plasma antinuclear antibodies and rheumatoid factor (RF) – negative disease. Children with chronic anterior uveitis usually

display no symptoms. For this reason, it is imperative to actively search for the symptoms of the disease and perform preventative eye examinations.

Uveitis associated with JIA is usually bilateral, without signs of granulation, chronic and recurrent. It may lead to complications such as band keratopathy, cataract, posterior adhesions, glaucoma or maculopathy [33, 34].

Special attention should be given to eye symptoms, which are an indication for urgent ophthalmological consultation, authors analyzed available literature in this subject and ocular disorders considered as associated with rheumatic diseases are summarized in Table I [1–34].

Some eye conditions can result from the use of medications in the treatment of rheumatic diseases. Chronic glucocorticosteroid therapy leads to cataracts, while maculopathy is associated with the use of antimalarial drugs. Long-term use of non-steroidal anti-inflammatory drugs can lead to keratopathy, methotrexate can cause punctate keratopathy, and D-penicillamine can lead to optic neuropathy [35].

The anatomical classification of eye involvement with prevalence of specific changes in rheumatic diseases according to data from analyzed literature is summarized in Table II [36–57].

Conclusion

Rheumatic diseases are often associated with ophthalmic complications; however, ophthalmic symptoms often precede rheumatic symptoms. Special attention should be given to symptoms related to the visual system, such as pain, sensitivity to light, tearing, redness of the eye, sudden deterioration of visual acuity, which require urgent ophthalmological consultation. For this reason, cooperation between rheumatologists and ophthalmologists as well as vigilance and active search for rheumatic diseases in patients with ocular abnormalities is so important.

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References

1. Harthan JS, Opitz DL, Fromstein SR, et al. Diagnosis and treatment of anterior uveitis: optometric management. *Clin Optom (Auckl)* 2016; 8: 23–35, DOI: 10.2147/OPTO.S72079.
2. Barisani-Asenbauer T, Maca SM, Mejdoubi L, et al. Uveitis – a rare disease often associated with systemic diseases and infections – a systematic review of 2619 patients. *Orphanet J Rare Dis* 2012; 7: 57, DOI: 10.1186/1750-1172-7-57.
3. Szaflik J, Bachtá A, Kulig M, et al. [Pharmacological treatment of recurrent idiopathic anterior uveitis]. *Klin Oczna* 2011; 113: 111–116 [Article in Polish].
4. Cunningham ET Jr, McCluskey P, Pavesio C, et al. Scleritis. *Ocul Immunol Inflamm* 2016; 24: 2–5, DOI: 10.3109/09273948.2016.1136190.
5. Zlatanović G, Veselinović D, Cekić S, et al. Ocular manifestation of rheumatoid arthritis – different forms and frequency. *Bosn J Basic Med Sci* 2010; 10: 323–327, DOI: 10.17305/bjbm.2010.2680.
6. Song IS, Lee SM. Ocular Manifestations of Sjögren Syndrome. *Hanyang Med Rev* 2016; 36: 161–167, DOI: 10.7599/hmr.2016.36.3.161.
7. Beckman KA, Luchs J, Milner MS. Making the diagnosis of Sjögren's syndrome in patients with dry eye. *Clin Ophthalmol* 2015; 10: 43–53, DOI: 10.2147/OPHT.S80043.
8. Majdan M. Zespół Sjögrena. *Wyd. Lek. PZWL, Warszawa* 2021.
9. Khan MA, Haroon M, Rosenbaum JT. Acute Anterior Uveitis and Spondyloarthritis: More Than Meets the Eye. *Curr Rheumatol Rep* 2015; 17: 59, DOI: 10.1007/s11926-015-0536-x.
10. Oh BL, Lee JS, Lee EY, et al. Recurrent anterior uveitis and subsequent incidence of ankylosing spondylitis: a nationwide cohort study from 2002 to 2013. *Arthritis Res Ther* 2018; 20: 22, DOI: 10.1186/s13075-018-1522-2.
11. Gouveia EB, Elmann D, de Ávila Morales MS. Ankylosing spondylitis and uveitis: overview. *Rev Bras Reumatol* 2012; 52: 742–756 [Article in English, Portuguese].
12. Carter JD. Treating reactive arthritis: insights for the clinician. *Ther Adv Musculoskelet Dis* 2010; 2: 45–54, DOI: 10.1177/1759720X09357508.
13. Nidavani RB, Mahalakshmi AM, Krishna KL. Update on the diagnosis and management of Reactive arthritis (Reiter's syndrome). *Der Pharmacia Sinica* 2015; 6: 12–18.
14. Ohsie LH, Murchison AP, Wojno TH. Lupus erythematosus profundus masquerading as idiopathic orbital inflammatory syndrome. *Orbit* 2012; 31: 181–183, DOI: 10.3109/01676830.2011.648813.
15. Cojocar M, Cojocar IM, Silosi I, Vrabie CD. Manifestations of systemic lupus erythematosus. *Maedica (Bucur)* 2011; 6: 330–336.
16. Choudhary MM, Hajj-Ali RA, Lowder CY. Gender and ocular manifestations of connective tissue diseases and systemic vasculitides. *J Ophthalmol* 2014; 2014: 403042, DOI: 10.1155/2014/403042.
17. Brydak-Godowska J. [Ocular changes and general condition in lupus erythematosus (SLE) – own observation]. *Klin Oczna* 2007; 109: 11–14 [Article in Polish].
18. Suvajac G, Stojanovich L, Milenkovich S. Ocular manifestations in antiphospholipid syndrome. *Autoimmun Rev* 2007; 6: 409–414, DOI: 10.1016/j.autrev.2006.11.005.
19. Rahim A, Kumar P, Burns J, Sampath R. Isolated ocular cutaneous involvement in antiphospholipid syndrome. *Orbit* 2012; 31: 367–369, DOI: 10.3109/01676830.2012.694554.
20. Gomes Bde A, Santhiago MR, Magalhães P, et al. Ocular findings in patients with systemic sclerosis. *Clinics (Sao Paulo)* 2011; 66: 379–385, DOI: 10.1590/s1807-59322011000300003.
21. Waszczykowska A, Goś R, Waszczykowska E, et al. Prevalence of ocular manifestations in systemic sclerosis patients. *Arch Med Sci* 2013; 9: 1107–1113, DOI: 10.5114/aoms.2013.39217.
22. Kozikowska M, Luboń W, Kucharz EJ, Mrukwa-Kominek E. Ocular manifestations in patients with systemic sclerosis. *Reumatologia* 2020; 58: 401–406, DOI: 10.5114/reum.2020.102004.

23. Sheraj J, Nițescu D. Ocular manifestations of connective tissue disease. *Rev Romana de Reumatologie* 2012; 4: 214–217.
24. Foroozan R. Visual loss from optic neuropathy in dermatomyositis. *Rheumatology (Oxford)* 2004; 43: 391–393, DOI: 10.1093/rheumatology/keh040.
25. Watkins AS, Kempen JH, Choi D, et al. Ocular disease in patients with ANCA-positive vasculitis. *J Ocul Biol Dis Infor* 2009; 3: 12–19, DOI: 10.1007/s12177-009-9044-4.
26. Kubal AA, Perez VL. Ocular manifestations of ANCA-associated vasculitis. *Rheum Dis Clin North Am* 2010; 36: 573–586, DOI: 10.1016/j.rdc.2010.05.005.
27. Védrine L, Algayres JP, Coutant G. Giant-cell arteritis. *N Engl J Med* 2003; 348: 1497–1498; author reply 1497–1498, DOI: 10.1056/NEJM200304103481517.
28. Weyand CM, Liao YJ, Goronzy JJ. The immunopathology of giant cell arteritis: diagnostic and therapeutic implications. *J Neuroophthalmol* 2012; 32: 259–265, DOI: 10.1097/WNO.0b013e318268aa9b.
29. Peter J, David S, Danda D, et al. Ocular manifestations of Takayasu arteritis: a cross-sectional study. *Retina* 2011; 31: 1170–1178, DOI: 10.1097/IAE.0b013e3181fe540b.
30. Peter J, David S, Joseph G, et al. Hypoperfusive and hypertensive ocular manifestations in Takayasu arteritis. *Clin Ophthalmol* 2010; 4: 1173–1176, DOI: 10.2147/OPTH.S12331.
31. Dąbrowska-Zimoń A, Bobrowska-Snarska D, et al. [Choroba Behçeta – rzadko rozpoznawana choroba w Polsce]. *Reumatologia* 2007; 45: 431–435 [Article in Polish].
32. Al-Mujaini A, Wali UK. Frosted branch angiitis, neuroretinitis as initial ocular manifestation in Behçet disease. *Indian J Ophthalmol* 2011; 59: 240–241, DOI: 10.4103/0301-4738.81048.
33. Tugal-Tutkun I. Pediatric uveitis. *J Ophthalmic Vis Res* 2011; 6: 259–269.
34. Smolewska E, Żuber Z. [Aktualne cele, możliwości i perspektywy leczenia młodzieńczego idiopatycznego zapalenia stawów w Polsce i na świecie]. *Forum Reumatologiczne* 2016; 2: 14–20 [Article in Polish].
35. Harnidech F, Prete PE. Ophthalmologic Manifestation of Rheumatic Diseases. *Semin Arthritis Reum* 2001; 30: 217–241, DOI: 10.1053/sarh.2001.16639.
36. Rosenbaum JT. Uveitis in spondyloarthritis including psoriatic arthritis, ankylosing spondylitis, and inflammatory bowel disease. *Clin Rheumatol* 2015; 34: 999–1002, DOI: 10.1007/s10067-015-2960-8.
37. Rosenbaum JT, Dick AD. The Eyes Have it: A Rheumatologist's View of Uveitis. *Arthritis Rheumatol* 2018; 70: 1533–1543, DOI: 10.1002/art.40568.
38. Heiligenhaus A, Minden K, Föll D, Pleyer U. Uveitis in juvenile idiopathic arthritis. *Dtsch Arztebl Int* 2015; 112: 92–100, DOI: 10.3238/arztebl.2015.0092.
39. Mimier-Janczak M, Kaczmarek D, Proc K, et al. Evaluation of Subclinical Retinal Disease in Patients Affected by Systemic Lupus Erythematosus with No Evidence of Ocular Involvement – An Optical Coherence Tomography Angiography Original Study. *J Clin Med* 2022; 11:7417, DOI: 10.3390/jcm11247417.
40. Sainz de la Maza M, Foster CS, Jabbur NS, Baltatzis. Ocular characteristics and disease associations in scleritis-associated peripheral keratopathy. *Arch Ophthalmol* 2002; 120: 15–19, DOI: 10.1001/archophth.120.1.15.
41. Uribe-Reina P, Muñoz-Ortiz J, Cifuentes-González C, et al. Ocular Manifestations in Colombian Patients with Systemic Rheumatologic Diseases. *Clin Ophthalmol* 2021; 15: 2787–2802, DOI: 10.2147/OPTH.S306621.
42. Miserocchi E, Fogliato G, Modorati G, Bandello F. Review on the worldwide epidemiology of uveitis. *Eur J Ophthalmol* 2013; 23: 705–717, DOI: 10.5301/ejo.5000278.
43. Sfiriadaki E, Tsiara I, Theodossiadis P, Chatziralli I. Ocular Manifestations of Granulomatosis with Polyangiitis: A Review of the Literature. *Ophthalmol Ther* 2019; 8: 227–234, DOI: 10.1007/s40123-019-0176-8.
44. Cornec D, Jousse-Joulin S, Pers J-O, et al. Contribution of salivary gland ultrasonography to the diagnosis of Sjögren's syndrome: toward new diagnostic criteria? *Arthritis Rheum* 2013; 65: 216–225, DOI: 10.1002/art.37698.
45. Klareskog L, Catrina AI, Paget S. Rheumatoid arthritis. *Lancet* 2009; 373: 659–672, DOI: 10.1016/S0140-6736(09)60008-8.
46. Evereklioglu C. Current concepts in the etiology and treatment of Behçet disease. *Surv Ophthalmol* 2005; 50: 297–350, DOI: 10.1016/j.survophthal.2005.04.009.
47. Sanchez JJ, Finger DR, Bradshaw DJ. Orbital inflammatory syndrome and systemic lupus erythematosus. *J Clin Rheumatol* 1995; 1: 295–298, DOI: 10.1097/00124743-199510000-00008.
48. Feuerstein JD, Cheifetz AS. Crohn disease: epidemiology, diagnosis, and management. *Mayo Clin Proc* 2017; 92: 1088–1103, DOI: 10.1016/j.mayocp.2017.04.010.
49. Moreland LW, Curtis JR. Systemic nonarticular manifestations of rheumatoid arthritis: focus on inflammatory mechanisms. *Semin Arthritis Rheum* 2009; 39: 132–143, DOI: 10.1016/j.semarthrit.2008.08.003.
50. Tugal-Tutkun I, Onal S, Altan-Yaycioglu R, et al. Uveitis in Behçet disease: an analysis of 880 patients. *Am J Ophthalmol* 2004; 138: 373–380, DOI: 10.1016/j.ajo.2004.03.022.
51. Tridiyoga KP, Pramita IAA, Juliar IGAM, et al. Nodular anterior scleritis in systemic sclerosis: a case report. *Intisari Sains Medis* 2021; 12: 147–151.
52. Rosenbaum JT, Simpson J, Neuwelt CM. Successful treatment of optic neuropathy in association with systemic lupus erythematosus using intravenous cyclophosphamide. *Br J Ophthalmol* 1997; 81: 130–132, DOI: 10.1136/bjo.81.2.130.
53. Rothschild P, Pagnoux C, Seror R. Ophthalmologic manifestations of systemic necrotizing vasculitides at diagnosis: a retrospective study of 1286 patients and review of the literature. *Semin Arthritis Rheum* 2013; 42: 507–514, DOI: 10.1016/j.semarthrit.2012.08.003.
54. Nithyanandam S, Mohan A, Sheth U. Anterior ischemic optic neuropathy in a case of Takayasu's arteritis. *Oman J Ophthalmol* 2010; 3: 94–95, DOI: 10.4103/0974-620X.64236.
55. Majumder AK, Roy R, Sitaula RK, et al. Retinal Vasculitis in a Patient with Ankylosing Spondylitis: A rare Association. *Nepal J Ophthalmol* 2018; 10: 86–89, DOI: 10.3126/nepjoph.v10i1.21719.
56. Aoki T, Yokoi N, Nagata K, et al. Investigation of the relationship between ocular sarcoidosis and dry eye. *Sci Rep* 2022; 12: 3469, DOI: 10.1038/s41598-022-07435-6.
57. Fox RI. Sjögren's syndrome. *Lancet* 2005; 366: 321–331, DOI: 10.1016/S0140-6736(05)66990-5.