

Orbital myositis, a cause of pediatric painful ophthalmoplegia

Miositis orbitaria, una causa de oftalmoplejía dolorosa en pediatría

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What do we know about the subject matter of this study?

Orbital myositis is an idiopathic inflammatory process, which is unusual in pediatric age. It causes acute eye pain, diplopia, eye movement limitation, and is an ophthalmological emergency due to its sequelae. Systemic steroids are the mainstay of treatment.

What does this study contribute to what is already known?

Our patient was diagnosed through the symptoms, the study of other pathologies, and orbit MRI, without the need for a biopsy. Treatment with systemic steroids was successful with complete remission during follow-up.

Abstract

Orbital myositis (OM) is a serious inflammation of extraocular muscles with unknown etiology. Pediatric presentation is rare and often affects more than one individual in a family, suggesting a genetic predisposition. **Objective:** To describe a pediatric case of orbital myositis, its clinical characteristics, and the usefulness of MRI for confirming the diagnosis. **Clinical Case:** A 13-year-old female patient presenting with acute headache, right periorbital pain, exacerbated by eye movements, and blurred vision. We ruled out thyrotoxic myopathy, infectious diseases, autoimmunity, and malignancy. An MRI showed right medial rectus muscle myositis and no evidence of optic neuritis. She was treated with intravenous systemic glucocorticoids followed by oral steroids with complete clinical resolution. **Conclusions:** OM has unknown etiology and can present a malignant course. Due to its unspecific clinical presentation, a comprehensive differential diagnosis should be made and it should consider performing MRI. Early treatment avoids permanent damage of extraocular muscles.

Keywords:

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Introduction

Orbital myositis (OM) is a rare condition. It was initially called an orbital inflammatory pseudotumor and was first described by Gleason, Busse, and Hochheim in 1903¹. It is a primary inflammatory process of the extraocular muscles, of unknown etiology. Myositis may occur in isolation or be associated with periorbital soft tissue inflammation with dacryoadenitis, orbital fat involvement, and optic perineuritis, however, the latter is a rare finding¹. It is believed that an autoimmune process triggers it, which involves both cellular and humoral immunity, and is responsible for causing complement-mediated thrombotic microangiopathy (TMA)^{2,3}.

It often affects more than one individual in a family, suggesting some degree of genetic predisposition⁴. OM shares clinical characteristics with infectious, autoimmune, and oncological diseases⁵. The involvement is predominantly unilateral and typically presented acute or subacute painful ophthalmoplegia, eyelid erythema, chemosis, and proptosis. Diplopia and decreased visual acuity can vary according to the extent of anatomical involvement and are considered ophthalmological emergencies^{5,6}.

Early diagnosis is associated with a better response to systemic steroids, which are the first-line treatment⁷. However, despite timely treatment, half of the cases recur or are dependent on steroids and other treatments such as radiotherapy, immunosuppressive agents, and immunoglobulins⁸.

The objective of this publication is to describe a case of orbital myositis occurring at pediatric age, its clinical characteristics, and the usefulness of orbit MRI for confirming the diagnosis, considering possible differential diagnoses. This publication has the informed consent of the parents and was approved by the institutional Ethics Committee.

Clinical Case

13-year-old female patient, with no significant history. She presented at the Emergency Department referring a one-week headache, right periorbital pain, exacerbated with eye movements, and blurred vision. She initially was treated with Naproxen which improved the headache, but not the visual symptoms.

On neuro-ophthalmological examination, we observed decreased visual acuity (corrected 20/25 bilateral), pupils equal and reactive to light of 3mm, without relative afferent pupillary defect. It was evidenced limitation in right eye abduction, and ipsilateral pain with eye movements. In the fundus, we observed both pink optic discs with sharp margins, no fiber layer edema,

healthy macula, and adhered retina. The patient had no periorbital inflammatory signs.

She was evaluated in the Pediatric Neurology and Ophthalmology Service and there were further studies. We ruled out vitamin deficiency, blood count was normal, the angiotensin-converting enzyme was negative; thyroid-stimulating hormone (TSH), triiodothyronine (T3), free thyroxine (FT4), TPOAb, TgAb, and TRAb were within the normal range or were negative. In addition, autoimmune tests were performed that included antinuclear antibodies (ANA), extractable nuclear antigen antibodies (ENA), anti-neutrophil cytoplasmic antibodies (ANCA), rheumatoid factor, and IgG4 antibodies, which were all negative. Protein electrophoresis was normal. Toxoplasmosis and syphilis infection were also ruled out, and the CSF study was normal.

A plain orbit MRI with gadolinium was performed (figure 1), which showed in the T2 sequence an increase in the signal and thickening of the right medial rectus muscle (figure 1-a). In the T2 sequence with fat suppression, it showed thickening and hyperintense signal in the right medial rectus muscle without involving the insertions (figure 1-b). The contrasted T1 sequence with fat suppression showed a thickening of the medial rectus with contrast medium uptake and striated intra- and extra-conal fat (figure 1-c), suggesting inflammatory muscle involvement. No alterations were observed in the optic nerve, thus ruling out the initial suspicion of optic neuritis.

With these findings, we established the diagnosis of OM in the medial rectum which was treated with methylprednisolone 1 g/day/IV for 3 days, followed by methylprednisolone 250 mg/day/IV and prednisolone 50 mg/oral until completing 14 days of treatment. The patient was discharged on the eighth day of hospitalization with no pain, no limitation of eye movements, improved visual acuity, and without diplopia. During the one-year follow-up, she did not present any recurrence of symptoms.

Discussion

The OM is a rare entity in Pediatrics since the most frequent age of presentation is between 30 and 40 years old⁷. Therefore, pediatric patients require a complete clinical evaluation and a rigorous study of other pathologies with similar characteristics.

The presentation spectrum varies from oligosymptomatic OM to severe eye movement involvement⁵. In a series of five cases of OM, aged between 28 and 66 years, all patients presented diplopia and retrobulbar pain, 2 patients conjunctival injection, 2 patients presented binocular symptoms, and 3 had more than one

muscle affected. The muscle most frequently involved was the medial rectum, confirmed by orbit MRI⁵. Medial rectus muscle involvement is described more frequently than the inferior rectus one⁸ and, infrequently, the levator palpebrae superioris muscle involvement has been described⁹.

The main differential diagnosis of OM is dysthyroid orbitopathy which thickens the extraocular muscles, so both conditions presented with similar symptoms¹⁰. Other etiologies that should be considered are Lyme disease¹¹, varicella-zoster virus infection¹², group A streptococcus¹³, and parasites¹⁴, which are usually studied according to local epidemiology. Autoimmune diseases such as vasculitis¹⁵, sarcoidosis¹⁶, lupus¹⁷, and Crohn's disease¹⁸ are another group of possible causes

that should be ruled out. IgG4-related diseases also become important within the differential diagnosis, because there are reports of cases of OM due to infiltration of IgG4-expressing plasma cell¹⁹. The serum autoantibodies measured in our patient for rheumatic diseases were negative, although, for the IgG4-related disease, no antibodies against tissue were studied since no histopathological study was carried out due to the improvement with the steroidal treatment.

Another way of orienting the study of differential diagnoses is according to the pattern of mono or binocular involvement. For instance, primary or metastatic tumors, arteriovenous malformations^{5,6}, ocular migraine, and Tolosa-Hunt syndrome are usually monocular pathologies, while systemic autoimmune

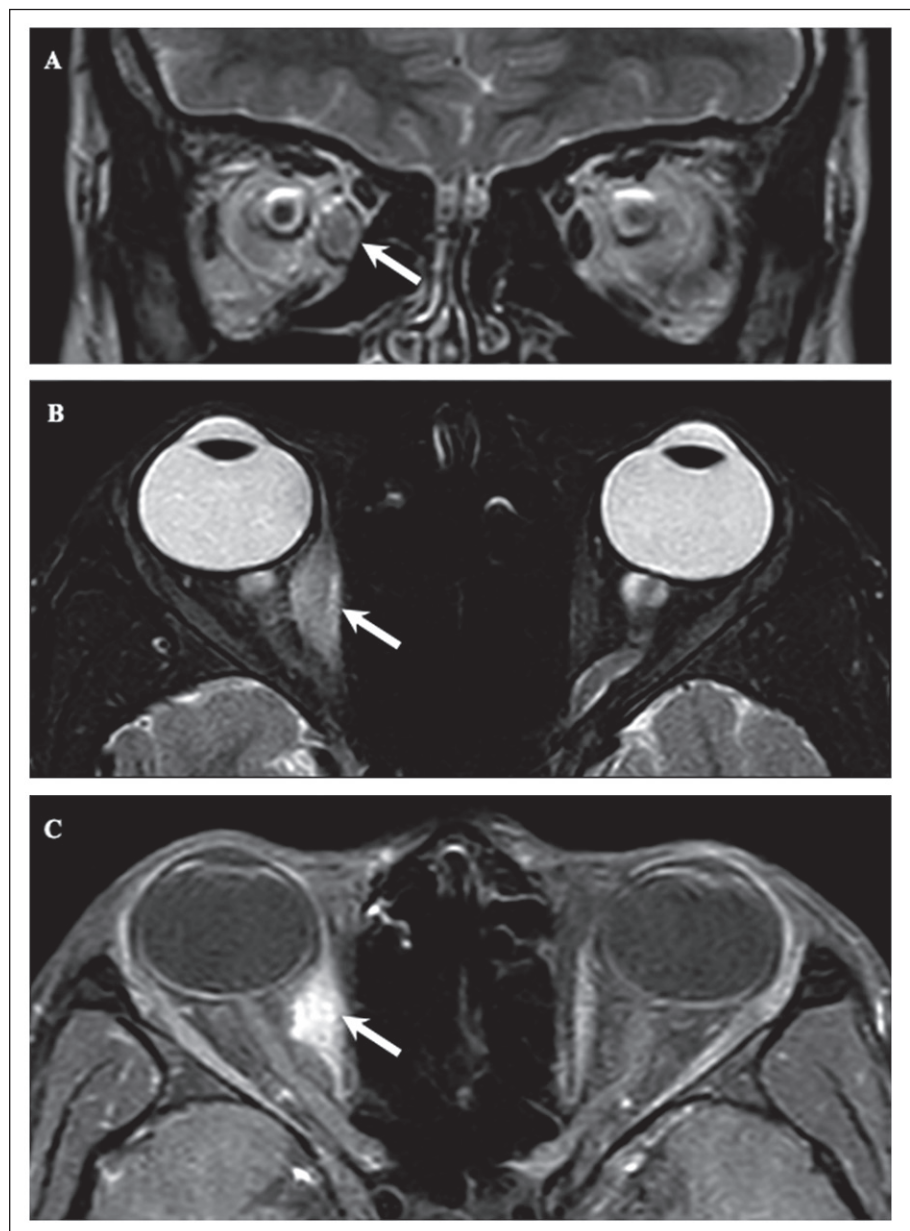


Figure 1. **A.** Orbits MRI. Coronal T2-weighted: enlargement and increased T2-signal within the right internal rectus muscle (white arrow). **B.** Orbits MRI. Axial T2-weighted with fat suppression: enlargement and hyperintensity of the right internal rectus muscle with preserved myotendinous junction (white arrow). **C.** Orbits MRI. Axial T1-weighted with contrast and fat suppression: enlargement of the internal rectus, contrast uptake at this level and striation of intra and extra conal fat (arrow).

diseases, thyroid eye disease, myasthenia gravis¹⁴, oculopharyngeal muscular dystrophy, Kearns-Sayre syndrome, Miller-Fisher variant of Guillain-Barré syndrome, and mitochondrial diseases are usually binocular pathologies and are often accompanied by other neurological symptoms⁵. In our patient, the involvement was monocular as in most reports of OM and did not appear with other neurological signs.

Orbit MRI is the imaging study of choice⁵. The most useful sequences are T2 and T1 contrasted with fat suppression, spin-echo sequence, and diffusion-weighted imaging. The typical characteristics of OM are a thickening of the affected extraocular muscles, increased signal in T2, and contrast medium uptake. Contrast enhancement is often seen at the muscle-tendon junction and the surrounding fat²⁰. These characteristics differentiate it from dysthyroid orbitopathy that, in most cases, does not affect the muscle-tendon junction, nor the surrounding fat, and usually does not affect the lateral rectus and the superior oblique muscles¹⁰.

The imaging changes in OM may be similar to those found in IgG4-related disease, but this is associated with bilateral inflammation of the lacrimal glands and extraocular muscles, especially the inferior rectum, but without tendon involvement¹⁹. In carotid-cavernous fistula, signs of myositis can be observed accompanied by venous congestion⁵, but in this condition, the superior ophthalmic vein is dilated.

The presence of metastasis or lymphoma can also be confused with an orbital myositis, in which a focal mass with increased signal intensity can be observed in the extraocular muscles²¹. In sarcoidosis, myositis can be present but it is rarely isolated and is almost always accompanied by uveitis and cavernous sinus inflammation²⁰.

The histopathological finding described in OM is a non-specific infiltration of lymphocytes, plasma cells, and histiocytes. The biopsy is an invasive procedure that exposes the patient to multiple complications and is therefore indicated only in cases with an inadequate response to steroids⁶.

The first-line treatment of OM is systemic steroids since most patients improve rapidly in the first days after the administration²². The steroid of choice is oral prednisone, although intravenous methylprednisolone has also been used with good results²². Other therapies used are the combination of intraorbital betamethasone and indomethacin²³. Up to 60% of patients who initially do not present a good response to steroids can relapse, therefore, it is recommended in these patients to administer high doses of steroids⁶.

Other types of immunosuppressant drugs must be administered in those patients who relapse or do not respond to steroids. The most widely used is metho-

trexate²⁴, although cyclosporine A, cyclophosphamide, and azathioprine are also used with some frequency⁵. In addition, using biological agents, such as infliximab, has proven to be an efficient treatment and has shown good control of the disease²⁵. The choice of the immunosuppressant drug must be individualized since there are no conclusive studies on which treatment is more effective²²⁻²⁵. Radiation therapy can be used if there is no response to initial management or if there is recurrence⁵.

Usually, the prognosis is good as long as they respond to treatment since the full recovery of muscle function can be achieved. Those cases with recurrence are the ones who achieve the least complete recovery²².

Conclusions

OM is a disease of unknown etiology that can have a malignant course. Given its non-specific clinical presentation, it requires an approach that allows to rule out other pathologies with similar clinical characteristics. Within the study, it is very useful to perform an orbit MRI, which allows evaluating in a non-invasive way all the orbital structures. Knowing this diagnosis is essential for the systematic study and early treatment with steroids. The prognosis depends on the response to the treatment, but in most patients it is good. The main sequel is the severe involvement of eye movements and vision.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

Financial Disclosure

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