American Journal of Ophthalmology Case Reports 19 (2020) 100824

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Bilateral papilledema and abducens nerve palsy following cerebral venous sinus thrombosis due to Gradenigo's syndrome in a pediatric patient

Jorge Vasco Costa [a,*,1], Marina João [a], Sandra Guimarães [b]

[a] Ophthalmology Department, Hospital de Braga, Sete Fontes – São Victor, 4710-243, Braga, Portugal
[b] Ophthalmology Department Hospital-Escola da Universidade Fernando Pessoa, Avenida Fernando Pessoa, Nº 150 4420-096, Gondomar, Portugal

ARTICLE INFO

Keywords:
Intracranial hypertension
Cerebral venous thrombosis
Gradenigo's syndrome
Abducens nerve palsy
Bilateral papilledema

ABSTRACT

Purpose: To report a case of bilateral papilledema and abducens nerve palsy following cerebral venous sinus thrombosis in a 9-year-old female with undiagnosed Gradenigo's Syndrome.
Observations: The patient presented to our Emergency Room with a unilateral left 6th nerve palsy, left eye relative afferent pupillary defect, and bilateral papilledema. She underwent cranial magnetic resonance imaging with gadolinium contrast and magnetic resonance venography, which diagnosed a left mastoiditis, left sigmoid sinus and jugular vein thrombosis. The patient underwent urgent mastoidectomy and myringotomy with tube placement and was admitted for adequate treatment with intravenous antibiotics and anticoagulants.
Conclusions and importance: Gradenigo's syndrome is a rare complication of otitis media, and even rarer is cerebral venous thrombosis. This potentially life-threatening situation requires immediate surgical and antibiotic therapy. Ocular symptoms can be the initial signs of this illness.

1. Introduction

Acute otitis media (AOM) is a common childhood infection, affecting 50%–85% of all children before the age of 3.[1] Since the advent of antibiotics, its complications have been on the decline, affecting less than 1% of all cases.[2] However, intracranial complications such as Gradenigo's syndrome can be serious and even life-threatening because of the proximity of the middle ear to the skull base and the nonspecificity of initial symptoms.[3] Ocular manifestations are extremely rare, and usually include abducens nerve palsy, papilledema, proptosis, and Horner syndrome.[4] The purpose of this report is to describe the clinical case of a 9-year-old female with a cerebral venous sinus thrombosis due to Gradenigo's syndrome, its ophthalmologic manifestations, and the ophthalmologist's role in the diagnosis of this illness.

1.1. Case report/case presentation

A 9-year old female presented to our Ophthalmology emergency department after her teacher noticed an occasional OS deviation in class on that same day. She also complained of a 5-day acute-onset left torticollis and mild neck pain on the same side. She denied diplopia, pain with ocular movements, vision loss, visual field defects, or any other systemic symptoms. There was no history of head or ocular trauma. The parents stated that she had two similar episodes in the previous 3 months, which resolved spontaneously. Both parents also reported that she had been lethargic since she had chickenpox followed by an AOM, treated with amoxicillin. They also mentioned that it took a second antibiotic (amoxicillin/clavulanate) to treat an ear infection since there was a clinical worsening with the first one. There was no other relevant ocular or medical history. The tympanic temperature was 36,4 °C. On ophthalmic examination, her best-corrected visual acuity (BCVA) was 20/25 OD and 20/200 OS. She had a relative afferent pupillary defect (RAPD) of the left eye, mild 2mm OS proptosis, and there was a mild restriction of the OS abduction. All other ocular movements were without restrictions and painless. The alternate cover test revealed a mild left eye esotropia. The anterior segment of both eyes was normal on slit lamp examination. Fundoscopy revealed bilateral Frisen grade 5 papilledema with surrounding cotton wool spots, numerous flame hemorrhages, and macular edema, especially of the left eye. SD-OCT (Spectralis OCT, Heidelberg Engineering) confirmed the fundoscopy findings (Fig. 1). Humphrey visual field testing was reliable and showed enlarged blind spots (Fig. 2).

* Corresponding author. Ophthalmology Department, Hospital de Braga, Sete Fontes, São Victor Braga, 4710-243, Portugal.
E-mail address: jc09094@gmail.com (J.V. Costa).
[1] Permanent address: Rua Poetisa Natália Correia, Nº50 4435-398 Rio Tinto, Portugal.

https://doi.org/10.1016/j.ajoc.2020.100824
Received 10 March 2020; Received in revised form 25 May 2020; Accepted 5 July 2020
Available online 10 July 2020

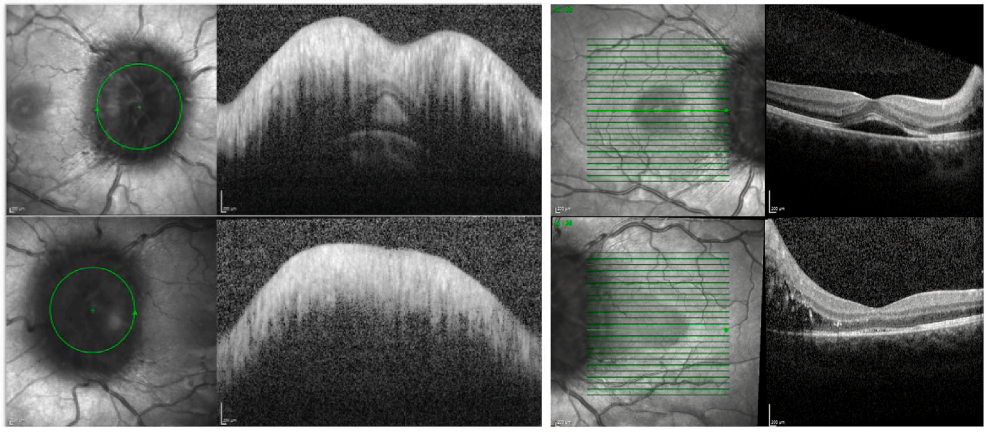

Fig. 1. Spectral-domain optical coherence tomography confirming the bilateral papilledema and macular edema at admission.

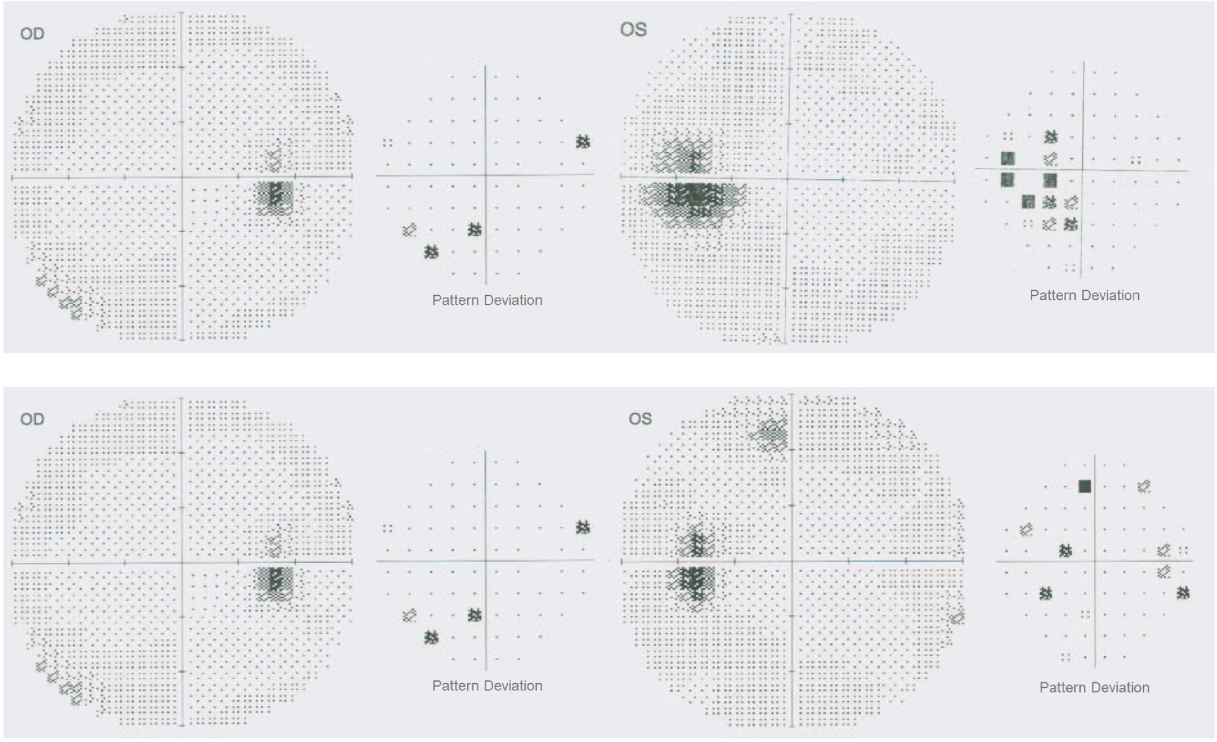

Fig. 2. Humphrey 30–2 automated visual field testing at admission (upper) and discharge (lower).

Evaluations by Pediatric and Neurology specialists were requested. Other neurological and meningeal signs were excluded. Initial blood work was unremarkable, with normal values of white blood cell count, thrombocytes, sedimentation rate, and C-reactive protein. Magnetic resonance imaging (MRI) with gadolinium contrast was then performed (Fig. 3). It revealed inflammatory signs in the left tympanic cavity and mastoid and attenuation of the left sigmoid sinus and jugular vein. Magnetic resonance venography (MRV) confirmed venous thrombosis (Fig. 3). The patient underwent successful urgent cortical mastoidectomy and myringotomy with tube placement and was admitted to the pediatric intensive care unit. After the surgery, adequate intravenous antibiotics (cefuroxime) and anticoagulation were started. 500 mg oral acetazolamide was also prescribed due to concerns of high intracranial pressure, although lumbar puncture was not performed, after considering the opposing risks of bleeding and thrombotic complications. Clinical and ophthalmological improvement was quickly noticed. All sets of blood cultures yielded no positive results. All prothrombotic parameters evaluated were within the normal range. Two days after admission, BCVA was 20/20 OD and 20/25 OS with RAPD resolution. Consecutive SD-OCTs showed slow improvement of the optic disk edema and resolution of the subretinal fluid of both eyes. Antibiotics were administered for 4 weeks, and anticoagulation was prescribed for 2 months. Clinical evolution was favorable and one month after admission, the patient was discharged. Two months after admission, the girl presented with BCVA of 20/20 OU and improvement of the optic disc edema. There was no proptosis, no torticollis, and no restriction of the ocular movements. Humphrey visual field testing showed no visual field defects and normal blind spot size of both eyes. (Fig. 2).

2. Discussion

Sixth cranial nerve palsy is the most frequent ocular motor dysfunction in children presenting with acquired strabismus.[5] A lesion anywhere in the nerve, from the pons to the orbit can cause a paresis or

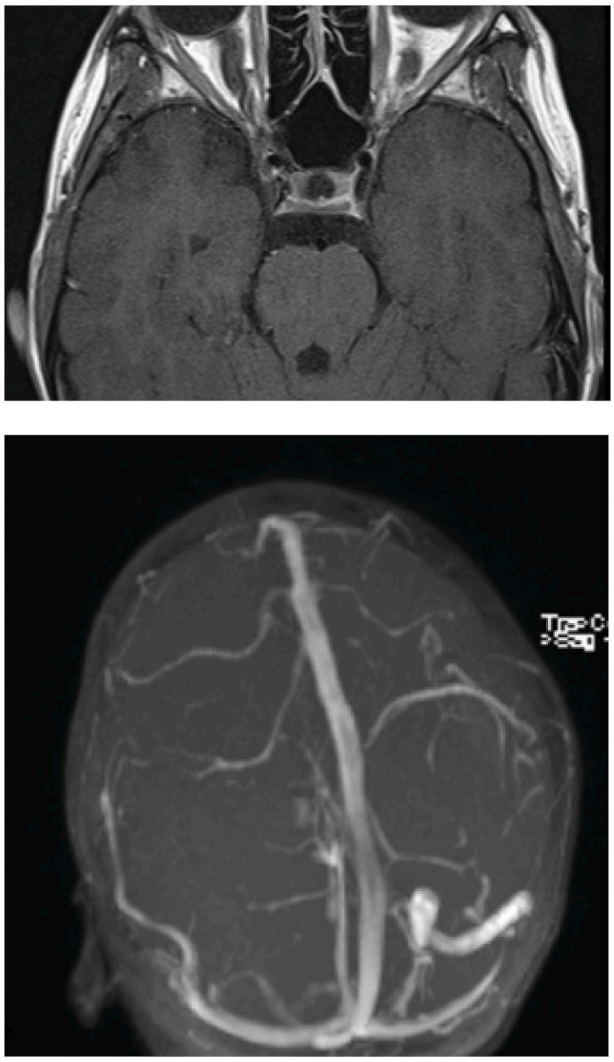

Fig. 3. Contrast-enhanced T1-weighted magnetic resonance imaging (upper) showing a heterogeneous abnormal enhancement of left cavernous sinus and magnetic resonance venography (lower) demonstrating no perfusion of the left sigmoid sinus and jugular vein.

palsy. Patients will present diminished function of the ipsilateral lateral rectus muscle, which will translate by an absent or limited abduction of the affected eye. The most common cause for an abducens nerve palsy in children is a neoplasm.[6] Other causes include trauma, elevated intracranial pressure, inflammatory and post-viral causes. Optic disk swelling (ODS) can occur from various causes and can reflect numerous etiologies, such as inflammatory, vascular, infectious, or toxic conditions, as well as intracranial lesions causing intracranial hypertension.[7] The most frequent cause of bilateral ODS is papilledema secondary to intracranial hypertension, especially at pediatric age.[8]

Nevertheless, in our young patient, both signs are attributed to other causes. Gradenigo's syndrome is a rare, potentially life-threatening condition in the modern antibiotic era characterized by the clinical triad of otitis media, abducens nerve palsy, and facial pain in the distribution of the trigeminal nerve due to petrous apicitis.[9] Bacteria spreads from the middle ear to the mastoid air cells and then to the petrous temporal bone, in which the trigeminal ganglion and abducens nerve are located. The timing of symptoms presentation may vary from a week[10] to several months or years[11] of otorrhea. Our young patient did not report symptoms of facial pain, which is not uncommon, particularly in cases with longer evolution.[11] Cerebral venous sinus thrombosis is a rare condition in children, and the majority occur in patients with multiple prothrombotic risk factors. However, in previously healthy patients, head and neck infections represent the most frequent predisposing factor. It mostly presents insidiously, with very nonspecific symptoms, such as light headache, irritability, ear pain, tenderness over the mastoid region, nausea and vomiting.[12] Proptosis, Horner syndrome, seizures and altered mental status can also manifest in a minority of patients. Diminished visual acuity is rare and is usually secondary to macular edema due to papilledema.[13]

In the reported case, we believe that the infection and inflammation of the petrous apicitis due to the extension of otitis media into the temporal bone resulted in inflammation of the meninges. Since the abducens nerve courses next to the mastoid region, a palsy of this nerve occurred.[9] Another explanation for this finding could be that the thrombosis also affected the inferior petrosal sinus that courses near the nerve. We also believe that the cerebral venous sinus thrombosis is attributed to either direct spread of the infection or from thrombophlebitis of small emissary veins of the mastoid that communicates with the sigmoid sinus.[4] This led to a reduction in blood flow and cerebrospinal fluid absorption, which caused an increased in the intracranial pressure and produced a bilateral papilledema.[14] This secondary intracranial hypertension could also be the reason for abducens nerve palsy. Sixth nerve palsy due to raised intracranial pressure occurs because of a downward displacement of the brainstem that stretches CN VI as it crosses over the petrous ridge and enters Dorello's canal. However, most cases are bilateral.[15] Nevertheless, we hypothesize that the increased intracranial pressure was asymmetric, causing left eye mild proptosis, vision loss, and nerve dysfunction (thus the greater optic disc edema and left eye RAPD). Lemierre's syndrome, a potentially grave and life-threatening disease, characterized by a septic thrombophlebitis of the internal jugular vein after acute oropharyngeal infection and subsequent disseminated septic embolization,[15] was ruled out since our patient did not develop fever throughout the entire hospitalization period, white blood cell count and inflammatory parameters were normal, and blood cultures were negative.

The diagnosis requires a high index of suspicion, and a definitive diagnosis can only be achieved by neuroimaging. MRI combined with MRV is the gold standard imaging test.[10] Head Computed Tomography (CT) cannot exclude cerebral venous sinus thrombosis, as it can miss the diagnosis in up to 40% of the patients.[16] Treatment with antibiotics and anticoagulation is mandatory as soon as the diagnosis is confirmed. Most patients also undergo myringotomy with tube insertion, in order to drain the infected site.[17] Presently, the prognosis is usually favorable. Some authors have reported that the mortality rate has become less than 3%[17] and that 6.5–15%[17,18] of the patients had long-term neurological or ophthalmological sequelae.

3. Conclusion

Cerebral venous sinus thrombosis is an extremely rare illness that courses with ophthalmologic complications. A high level of suspicion in patients with recidivated or chronic otitis and symptoms of headache, diplopia, torticollis, and blurry vision can lead to early identification and treatment. Therefore, since the ophthalmologist's role in the diagnosis of this disease can be an important one, we must be aware of the main clinical and radiological characteristics.

Patient consent

All procedures performed were in accordance with the tenets of the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from the parents of the patient involved.

Funding

No funding or grant support.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship. Jorge Vasco Costa conceptualized, collected data and originally wrote this case report. Marina João conceptualized, collected data and reviewed the original draft. Sandra Guimarães was in charge of supervision, review, and edition of this manuscript.

Declaration of competing interest

None of the authors have any proprietary interests or conflicts of interest related to this submission.

Acknowledgements

None.

References

1. Ren Y, Sethi RKV, Stankovic KM. Acute otitis media and associated complications in United States emergency departments. *Otol Neurotol*. 2018 Sep;39(8):1005–1011.
2. Rosenfeld RM, Kay D. Natural history of untreated otitis media. *Laryngoscope*. 2003 Oct;113(10):1645–1657.
3. Bales CB, Sobol S, Wetmore R, Elden LM. Lateral sinus thrombosis as a complication of otitis media: 10-year experience at the children's hospital of Philadelphia. *Pediatrics*. 2009 Feb;123(2):709–713.
4. Pollock TJ, Kim P, Sargent MA, et al. Ophthalmic complications of otitis media in children. *J AAPOS*. 2011 Jun;15(3):272–275.
5. Kodsi SR, Younge BR. Acquired oculomotor, trochlear, and abducent cranial nerve palsies in pediatric patients. *Am J Ophthalmol*. 1992 Nov 15;114(5):568–574.
6. Merino P, Gómez de Liaño P, Villalobo JM, Franco G, Gómez de Liaño R. Etiology and treatment of pediatric sixth nerve palsy. *J AAPOS*. 2010 Dec;14(6):502–505.
7. Lee AG, Beaver HA. Acute bilateral optic disk edema with a macular star figure in a 12-year-old girl. *Surv Ophthalmol*. 2002 Jan-Feb;47(1):42–49.
8. Hata M, Miyamoto K. Causes and prognosis of unilateral and bilateral optic disc swelling. *Neuro Ophthalmol*. 2017 Aug;41(4):187–191.
9. Matis GK, de A Silva DO, Chrysou OI, et al. Giuseppe Gradenigo: much more than a syndrome! Historical vignette. *Surg Neurol Int*. 2012;3:122.
10. Kantas I, Papadopoulou A, Balatsouras DG, Aspris A, Marangos N. Therapeutic approach to Gradenigo's syndrome: a case report. *J Med Case Rep*. 2010;4:151–154.
11. Jensen PVF, Hansen MS, Moller MN, Saunte JP. The forgotten syndrome? Four cases of Gradenigo's syndrome and a review of the literature. *Strabismus*. 2016;24:21–27.
12. Alvis-Miranda HR, Milena Castellar-Leones S, Alcala-Cerra G, Rafael Moscote-Salazar L. Cerebral sinus venous thrombosis. *J Neurosci Rural Pract*. 2013;4(4):427–438.
13. Balasubramanian A, Mohamad I, Sidek D. Extensive dural sinus thrombosis and bilateral lateral rectus palsy as an uncommon complication of chronic suppurative otitis media. *BMJ Case Rep*. 2013 Jan 25:2013.
14. Stam J. Thrombosis of the cerebral veins and sinuses. *N Engl J Med*. 2005 Apr 28;352(17):1791–1798.
15. Lee S, Rutar T, Velez FG, Rosenbaum AL. Lemierre's syndrome with fourth nerve palsy. *J AAPOS*. 2009 Feb;13(1):107–108.
16. Lafitte F, Boukobza M, Guichard JP, et al. MRI and MRA for diagnosis and follow-up of cerebral venous thrombosis (CVT). *Clin Radiol*. 1997;52:672–679.
17. Novoa E, Podvinec M, Angst R, Gurtler N. Paediatric otogenic lateral sinus thrombosis: therapeutic management, outcome and thrombophilic evaluation. *Int J Pediatr Otorhinolaryngol*. 2013;77:996–1001.
18. De Schryver EL, Blom I, Braun KP, et al. Dev. Long-term prognosis of cerebral venous sinus thrombosis in childhood. *Med. Child Neurol.* 2004;46:514–519.