CASE SERIES

Optic Neuritis in Children: Case Series of Differing Treatment and Literature Review

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ABSTRACT

Introduction: Optic neuritis is an inflammatory condition that can cause significant vision loss. Treatment is challenging due to its rarity and the complications of long-term steroid use. Paediatric treatment options are less well-defined compared to those for adults, as current protocols primarily derive from the adult-focused Optic Neuritis Treatment Trial (ONTT), which limits their overall applicability in paediatric care and outcomes. **Case series:** This case series reports on the treatment approaches and outcomes for bilateral optic neuritis in four children, all of whom were female. In the first case, no oral steroid taper was given following intravenous infusion. In contrast, the second and third cases were treated with intravenous infusion of different durations, followed by a tapering regimen lasting four weeks. No steroids were administered in the fourth case. Among the children who received steroids, visual outcomes ranged from 6/9 to 6/6, although the timing of recovery varied. The child who did not receive steroids had a slightly reduced visual acuity of 6/12 in one eye. These cases highlight the importance of considering various factors, including age, visual outcomes, recovery duration, medication side effects, relapse probability, and individual patient needs, when selecting the most appropriate corticosteroid treatment strategy. **Conclusion:** Early clinical recognition of optic neuritis, followed by prompt treatment, is warranted for all age groups. Tailoring treatment to individual needs is crucial for achieving the best outcomes with minimal side effects. There is a need for more paediatric-focused trials to guide clinicians in developing optimal treatment protocols for children with optic neuritis.
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INTRODUCTION

Optic neuritis is an inflammatory condition of one or both optic nerves, which leads to visual debilitation; where its characteristic features include vision loss, visual field defects (especially central and paracentral defect), pain on eye movement (though it may not be a common presentation in children) and dyschromatopsia (1). Establishing the best treatment approach is challenging, as it is uncommon among children, and the use of steroids as the mainstay has raised concerns due to its complications in long-term use. In this case series, we report four cases of bilateral optic neuritis in children, each with a distinct treatment approach.

CASE SERIES

Case 1

A seven-year-old Bidayuh girl presented with bilateral acute and progressive blurring of vision for two weeks. She did not complain of any other ocular or neurological symptoms. She denied any preceding symptoms of viral infection, such as fever or upper respiratory tract infection, and was pre-morbidly healthy with no history of recent immunization.

On examination, bilateral eye visual acuity was 6/48 with no relative afferent pupillary defect (RAPD) likely due to involvement of both eyes. The range of ocular motility was full with no associated pain on movement. Anterior segment examination was normal for both eyes, while fundus examination showed bilateral hyperaemic optic discs with swelling over the temporal half. A confrontation visual field test revealed a right eye central

scotoma and a left eye constricted peripheral visual field defect. However, colour vision, brightness sensitivity, and saturation tests were normal. Other systemic and neurological examinations were unremarkable. Blood investigations (blood inflammatory markers, infectious screening, routine blood chemistry) and chest x-ray were normal. The Mantoux test was negative. A computed tomography (CT) imaging of the brain and orbit showed no abnormalities such as optic nerve enhancement. Her parents did not consent to a lumbar puncture. As visual evoked potential (VEP) and magnetic resonance imaging (MRI) were not available in our facility, it was not carried out to screen for demyelinating diseases.

Diagnosis of bilateral optic neuritis was made based on clinical findings, and she was admitted for a five-day course of intravenous methylprednisolone (30mg/kg) with no oral steroid given. Her visual field defect resolved, and her vision improved to 6/12 on the second day of infusion. Bilateral visual acuity at two weeks of follow-up was 6/9. However, optic disc hyperaemia and swelling persisted at four months of follow-up, and her vision remained stable.

Infectious screening revealed a reactive serological result for HIV antibody, with an HIV-1 viral RNA count of 379 copies/ml and a CD4 count of 621 cells/μL. Two days after admission, he developed dysuria and urethral discharge. Urine nucleic acid amplification testing (NAAT) detected Chlamydia trachomatis and Neisseria gonorrhoeae. Screening for syphilis by rapid plasma reagin (RPR) test was non-reactive. Additionally, he had acute paronychia over his right middle finger, diagnosed clinically and treated empirically as a secondary bacterial infection.

After undergoing treatment with oral doxycycline 100mg once daily for one week and a single dose of intramuscular (IM) ceftriaxone 500mg, the urethral discharge and paronychia resolved. Antiretroviral therapy was initiated in the ward after five days, which he tolerated well. All the lesions resolved with new epithelialization after three weeks.

Case 2

A thirteen-year-old Melanau girl presented with a three-day history of sudden painless blurring of vision, which started over the left eye and subsequently involved the right eye a day later. She complained of drowsiness a day before her visual symptoms but was otherwise well with no recent immunisation.

Upon examination, visual acuity was 6/60 for the right eye and 5/60 for the left eye with no relative afferent pupillary defect likely due to bilaterality. Ocular movements, anterior chamber, and fundus examination were unremarkable. Confrontation visual field test revealed a right eye inferonasal visual field defect and a left eye central scotoma. Brightness sensitivity and red saturation were reduced in the left eye, with dyschromatopsia affecting both eyes. Systemic and neurological examinations were normal. Similar to case one, her routine blood investigations, Mantoux test, and imaging were unremarkable. Lumbar puncture was not done due to the parents' refusal.

A diagnosis of bilateral retrobulbar optic neuritis was made, and she was started on intravenous methylprednisolone (30mg/kg) for three days. After completing the infusion, her best corrected visual acuity was 6/6 for both eyes with a reduction of visual field defect. Improvement of brightness sensitivity and red saturation was also seen over the left eye. She was discharged with a tapering dose of oral prednisolone (1mg/kg) OD for four weeks.

At three weeks of follow-up, bilateral eye visual acuity was 6/6 with normal red saturation and brightness sensitivity, resolved visual field defect, and normal colour test. All was preserved at two months of follow-up. Some advice was given for both cases that if there was a recurrence of optic neuritis, a magnetic resonance imaging of the brain to screen for demyelinating disease is indicated.

Case 3

An eleven-year-old Indian girl with underlying obesity and developmental delay presented with five days of blurring of vision, preceded by three days of headache and dizziness. She also noticed visual glare while watching television two days before the onset of visual blurring. She denies any other visual symptoms and was well before this.

Her bilateral eyes' best corrected visual acuity was 3/60 with no RAPD. Red saturation was normal, but brightness sensitivity was reduced over the left eye. She also had dyschromatopsia in both eyes. Ocular movement and anterior chamber examination were unremarkable. Fundus examination showed bilateral optic disc swelling with blurred disc margins. There were no significant findings in systemic and neurological examinations, as well as routine blood investigations, cerebrospinal fluid analysis, and CT of the brain. MRI of the brain and orbit revealed enhancement of bilateral optic nerves, suggestive of optic neuritis.

She was started on intravenous methylprednisolone, one gram per day for five days, for bilateral eye optic neuritis. On day five of treatment, her vision improved to 6/9 over the right eye and 6/6 over the left eye, but she developed RAPD of the right eye. Her dyschromatopsia persisted while brightness sensitivity normalised. Hyperaemia of the optic discs with reduced swelling was noted. Upon completion of infusion, she was discharged with a tapering dose of oral prednisolone for four weeks. At three weeks of follow-up, visual acuity, dyschromatopsia, and disc hyperaemia were static

while optic disc swelling resolved. At four months, visual acuity remained at 6/9 over the right eye and 6/6 over the left eye, with resolution of the right eye RAPD. Colour vision improved, and disc hyperaemia reduced significantly. We were unable to proceed with further tests to screen for neuromyelitis optica spectrum disorder due to financial constraints.

Case 4

A six-year-old Malay girl was brought in by her parents as the teacher noticed her squeezing her eyelids while looking at the whiteboard for the past three months. The child has also been complaining of headaches for the same duration, with two to three episodes per month, which are relieved with sleep. These symptoms were preceded by an episode of fever and upper respiratory tract infection, which resolved spontaneously. She is otherwise a healthy child with no recent immunizations. The best corrected visual acuity for both eyes was 6/12 with a positive RAPD of the left eye. Red saturation and brightness sensitivity were equal, while colour vision, ocular movements, and anterior chamber examination were normal. Fundus examination revealed a bilateral hyperaemic disc with swelling nasally for the right eye and 360-degree blurring of the disc margin for the left eye. Systemic and neurological examination was unremarkable. Routine blood investigation and VEP, as well as contrasted CT Brain and Orbit, were performed, and there were no significant findings.

She was diagnosed as having bilateral eye post-viral papillitis and was discharged with Neubion tablets. At one month of follow-up, bilateral eye visual acuity deteriorated to 6/15. However, her optic disc appeared less hyperaemic and less swollen. During her subsequent follow-up at four months, her vision improved to 6/12 over the right eye and 6/9 over the left eye with reduced brightness sensitivity and a positive RAPD of the right eye. Optic discs were no longer swollen but remained mildly hyperaemic. Other optic nerve function tests were well preserved.

Table I: Summary of findings in case series and literature review.

	Case 1	Case 2	Case 3	Case 4	Yu Cheng et al, 2024	Chan L, Pereira N, 2024
Presentation	Bilateral acute, progressive blurring of vision for 2 weeks	Sudden bilateral painless blurring of vision for 3 days	Bilateral blurring of vision for 5 days and headache	Headache for 2-3 times/ month with blurring vision	Bilateral sudden blurring vision for 2 days	Right eye pain and blurring of vision for 8 days
Clinical Findings	VA OU 6/48 -OD central scotoma -OS constricted peripheral visual field -OU hyperaemic optic disc with swelling over temporal half	VA OD 6/60 VA OS 5/60 -OD inferonasal visual field defect -OS central scotoma, reduced brightness sensitivity and red saturation -OU dyschromatopsia	VA OU 3/60 -OS reduced brightness sensitivity -OU dyschromatopsia -OU optic disc swelling with blurred disc margin	VA OU 6/12 -OD positive RAPD -OU hyperaemic disc -OD swelling of optic disc nasally -OS 360-degree blurring of disc margin	VA OU 6/120 -OD central scotoma -OS upper half peripheral visual field defect - OU optic disc swelling *MOG IgG positive *Treated as MOG antibody associated disease	-OD positive RAPD -OD inferior altitudinal visual field defect -OD dyschromatopsia -OD papillitis and disc pallor
Intervention	IV MTP (30mg/kg) for 5 days, no oral steroid given	IV MTP (30mg/kg) for 3 days followed by tapering dose of oral prednisolone (1mg/kg) OD for 4 weeks.	IV MTP 1g per day for 5 days followed by tapering dose of oral prednisolone for 4 weeks	None	IV MTP 3 courses (3 days per course) + IVIG (between 1st and 2nd course) Then oral prednisolone 40mg tapered weekly	IV MTP (1 g/day for five days) then oral prednisone to taper the dose over 15 days
Follow-up 2-3 weeks	VA OU 6/9	VA OU 6/6	VA OD 6/9 OS 6/6	VA OU 6/15. Optic disc less hyperaemic and swollen	-	At Day 5 treatment, right eye vision clear
Follow up 4 months	Optic disc hyperaemia and swelling persisted at four months		VA OD 6/9 OS 6/6	VA OD 6/12 OS 6/9 Optic discs not swollen but remained mildly hyperaemic.	VA OD 20/16 OS 6/4.8 at 15 weeks Optic disc swelling improved.	-

MTP: methylprednisolone, IVIG: intravenous immunoglobulin, OU: bilateral eyes, OS: left eye, OD: right eye, VA: visual acuity, CNS: central nervous system, RAPD: relative afferent pupillary defect

DISCUSSION

Management of paediatric optic neuritis is still controversial at present, and recommendations only exist for adults guided by the Optic Neuritis Treatment Trial (ONTT), a randomized, controlled trial of corticosteroids for optic neuritis. Currently, the treatment basis for children is gleaned from this trial, where high-dose parenteral corticosteroids followed by two to four weeks of oral corticosteroid taper are recommended (2). Some practitioners do not practice oral steroid tapering, while some taper over a longer course. The children

in the first two cases presented to Hospital Bintulu, Sarawak, while the remaining two children were seen in the University of Malaya Medical Centre (UMMC). They were all females. In the first case, no oral steroid taper was given following the intravenous infusion, while in the second and third cases, a total of four weeks of tapering was given. In the fourth case, steroids were not initiated. Children who received steroids obtained visual outcomes of 6/9 or 6/6, although the timing of resolution varied. As for the child who did not receive any steroids, visual acuity was slightly lower (6/12) in one eye.

The decision on the choice of regime should be cautiously made, considering the age factor, visual requirement, speed of recovery, side effects of medications, and probability of relapse. The necessity of oral tapering dose is questionable, as some studies state that corticosteroid administration hastens recovery, but final visual outcome is not altered (3,4). The speedy recovery in school-going children is, however, justified as it allows them to resume school faster, subsequently eliminating psychosocial challenges and sequelae from visual dysfunction (1). In an age-dependent study, preschool children were noted to be more prone to neuro-behavioural adverse effects after corticosteroid administration (5). Hence, the practice of prolonged corticosteroid therapy in this age group is debatable as the benefit may not outweigh the risk. This supports the omission of oral steroid tapering in the younger child in our case series. In addition, a retrospective study of 26 children found comparable final visual acuity between two groups: both received three days of IV methylprednisolone, but only one received an additional two-week oral steroid taper (6). These findings align with both the treatment approach and outcomes observed in cases one and two of our series. Complications of prolonged oral corticosteroids use include growth retardation, adrenal suppression and cataract formation while corticosteroid infusion may cause side-effect such as systemic hypertension, facial flushing, peptic ulcer formation and many more, prompting vigilance during decision making (2). Fortunately, the treatment for all three children was uneventful.

Typical optic neuritis or demyelinating optic neuritis is often associated with multiple sclerosis and is usually unilateral and affects women (7). They present with clinical features such as blurring of vision, painful eye movement, dyschromatopsia, and either a normal optic disc or mild disc edema (7). Improvement normally occurs within a month of onset, regardless of steroid usage (7). On the other hand, atypical optic neuritis can result from infection, autoimmune or inflammatory disorder and its features include bilaterality, male gender, an age less than 18 years or greater than 50 years, progressive vision loss of more than 2 weeks, absence of pain on eye movement and pronounced disc edema (7). Younger children (<10 years of age) are more prone to have bilateral ON (8).

Child in case one showed atypical features and should be closely monitored, as the risk of relapse is high. She may have benefited from oral steroids after intravenous methylprednisolone. Older age groups (more than 11 years old) were noted to be more prone to recurrence and subsequent neurological diseases (9). Certain authors have pointed out that a longer course of oral steroid tapering may reduce recurrence, and this therefore justifies the oral steroid tapering in the older children in this case series (2,3). In the first case, the delay in seeking treatment may have affected her visual outcome, as other authors have reported that early treatment can improve the final visual outcome (10). Similarly, in the fourth case, there was a delay in getting medical attention, and the child was treated conservatively. Her visual outcome was not optimal, and therefore, a question arises whether it would have been better with steroid initiation. A similar case with post-viral optic neuritis was reported to have been given high-dose IV methylprednisolone and achieved a complete recovery (11).

CONCLUSION

In conclusion, early clinical recognition of optic neuritis followed by prompt treatment is warranted for all age groups. Treatment options should be individualized to ensure optimal outcomes with minimal side effects. Therefore, more trials for the paediatric age group are needed to assist clinicians in making the best treatment protocol for these patients in the future.

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REFERENCES

1. Yeh EA, Graves JS, Benson LA, Wassmer E, Waldman A. Pediatric optic neuritis. Neurology. 2016;87(9 Suppl 2):S53-8. https://doi.org/10.1212/WNL.0000000000002822
2. Bonhomme GR, Mitchell EB. Treatment of pediatric optic neuritis. Current treatment options in neurology. 2012;14(1):93-102 https://doi.org/10.1007/s11940-011-0159-0
3. Boomer JA, Siatkowski RM. Optic neuritis in adults and children. Seminars in Ophthalmology. 2003;18(4):174-80. https://doi.org/10.1080/08820530390895172
4. Borchert M, Liu GT, Pineles S, Waldman AT. Pediatric Optic Neuritis: What Is New. Journal of neuro-ophthalmology: the official journal of the North American Neuro-Ophthalmology Society. 2017;37(Suppl 1):S14-S22. https://doi.org/10.1097/WNO.0000000000000551
5. Mrakotsky CM, Silverman LB, Dahlberg SE, Alyman MC, Sands SA, Queally JT, et al. Neurobehavioral

side effects of corticosteroids during active treatment for acute lymphoblastic leukemia in children are age-dependent: report from Dana-Farber Cancer Institute ALL Consortium Protocol 00-01. Pediatric blood & cancer. 2011;57(3):492-8. https://doi.org/10.1002/pbc.23060

6. Mackay, D. D. Should patients with optic neuritis be treated with steroids? Current Opinion in Ophthalmology. 2015;26(6):439–444. http://doi.org/10.1097/ICU.0000000000000197
7. Abel A, McClelland C, Lee MS. Critical review: typical and atypical optic neuritis. Survey of Ophthalmology Journal. 2019;64(6):770-9. https://doi.org/10.1016/j.survophthal.2019.06.001
8. Waldman AT, Stull LB, Galetta SL, Balcer LJ, Liu GT. Pediatric optic neuritis and risk of multiple sclerosis: Meta-analysis of observational studies. Journal of American Association for Pediatric Ophthalmology and Strabismus. 2011;15(5):441–446. https://doi.org/10.1016/j.jaapos.2011.05.020
9. Singh D, Phuljhele S, Sharma R, Saxena R, Sharma P, Menon V. Clinical spectrum of pediatric optic neuritis in indian children. Ophthalmol Open J. 2017;2(2):20-6. http://dx.doi.org/10.17140/OOJ-2-109
10. Plant GT, Sibtain NA, Thomas D. Hyperacute corticosteroid treatment of optic neuritis at the onset of pain may prevent visual loss: a case series. Multiple sclerosis international. 2011;(2011):815068. https://doi.org/10.1155/2011/815068
11. Presicci A, Serra M, Achille M, Caputo E, Margari L. Pediatric Optic Neuritis: Description of Four Cases and Review of the Literature. Children (Basel). 2021;8(10):855. https://doi.org/10.3390/children8100855
12. Cheng Y, Wu Y. Pediatric acute bilateral optic neuritis: A case report. Biomedical reports. 2024;20(3):40. https://doi.org/10.3892/br.2024.1728
13. Chan L, Pereira N. Optic Neuritis in a 15-Year-Old Female Patient: A Case Report and Literature Review. Cureus. 2024;16(1): e53222. https://doi.org/10.7759/cureus.53222