

A Case Report of Nystagmus with Acute Comitant Esotropia Secondary to Heroin Withdrawal: A Novel Presentation

Richard L. Rabin

Department of Ophthalmology, Nassau University Medical Center, East Meadow, N.Y., USA

Key Words

Acute comitant esotropia · Acute concomitant esotropia · Heroin withdrawal · Strabismus · Neuro-ophthalmology · Heroin · Diplopia · Double vision

Abstract

Background: Acute comitant esotropia secondary to heroin withdrawal is a rarely reported phenomenon that has never been described with nystagmus. Adverse effects of heroin on eye alignment were first reported in soldiers returning from Vietnam, yet no theory is generally accepted as the cause of these abnormalities. **Method:** We present a case of a 22-year-old female who developed 40 prism diopters of alternating comitant esotropia with nystagmus 8 days after abrupt heroin cessation, review the existing literature, and propose a novel hypothesis for this phenomenon. **Results:** After 76 days, her esotropia resolved, and she was left with 7 prism diopters of esophoria. **Conclusion:** This case demonstrates that acquired nystagmus can present in addition to acute-onset esotropia after abrupt heroin cessation. We compare and contrast the theories of this mechanism and review the literature.

© 2015 S. Karger AG, Basel

Introduction

It has been documented that esotropia may occur from heroin withdrawal, but there has not been documentation of coexisting nystagmus. The unique presentation of our patient serves as an important addition to the literature on heroin withdrawal.

Rabin: A Case Report of Nystagmus with Acute Comitant Esotropia Secondary to Heroin Withdrawal: A Novel Presentation

Case Report

A 22-year-old white female drug abuser presented to the emergency department with a 2-day history of blurred vision, diplopia, and crossed eyes. The patient had a 1-year history of cocaine and oral opiate abuse that ended 1 year ago. For the last year, she had exclusively snorted heroin, smoked marijuana, and taken alprazolam orally. The patient stopped snorting heroin and smoking marijuana 10 days prior to presentation. The patient was using 10–15 ‘bags’ of heroin per day and said she would go into withdrawal if she did not use heroin for 6 h. She denied IV drug abuse and no track marks were present.

Ten days before presentation, the patient abruptly discontinued heroin. She self-administered alprazolam to control her agitation and withdrawal symptoms. She suffered 5–7 days of nausea, vomiting, headaches, diarrhea, and a 10-pound weight loss. On day 8 after her last heroin dose, she awoke with a headache, diplopia, blurriness, and was informed that her eyes appeared crossed. The patient’s vision worsened over the next 2 days causing her to seek treatment.

The patient denied any prior ocular problems. Specifically, she denied complaints involving ocular motility. This was confirmed by the patient’s mother. She denied memory, balance, swallowing, or speaking difficulties. There was no history of facial droop, weakness, or seizures. Review of systems was remarkable for anxiety due to a loss of a relative. According to her, she had also been in a car accident 3 years ago in which she was unrestrained and flew from the front passenger seat into the windshield, striking her head and cracking the windshield. The patient denied loss of consciousness at that time and did not seek medical care.

Past medical history was otherwise unremarkable. On arrival to the emergency department, CT of the head without contrast was performed and was unremarkable. Toxicology screen was positive for marijuana only.

Examination revealed a well-nourished 22-year-old female in no acute distress. She was not wearing an eye patch. Cover testing revealed an alternating comitant esotropia of 40 prism diopters (fig. 1; see online suppl. video 1; for all online suppl. material, see www.karger.com/doi/10.1159/000440763). Uncorrected visual acuity was 20/20 OU. Ductions and versions were full with end gaze horizontal nystagmus on both right and left gaze and a small degree of vertical nystagmus on upgaze in both eyes. The fast phase was in the direction of gaze. The patient complained of oscillopsia during these episodes.

The comitant esotropia and the large angle of strabismus without a significant abduction deficit make cranial nerve six palsy unlikely. Horizontal saccades were rapid and equal in both eyes. Pupils were equal and reactive from 4 mm to 2 mm with light. Ishihara color plates were 15/15 in each eye. Stereopsis was absent, but was reproducible to 400 s of arc using 45 prism diopters base out. There was no evidence of proptosis, convergence spasm, or divergence insufficiency. There was no evidence of a third, fourth, or sixth nerve palsy. Cycloplegic refraction was +1.00 +0.50 ×80 OD and +0.75 +1.00 ×95 OS. Cycloplegia had no effect on the degree of tropia.

Slit lamp examination was unremarkable. Tonometry revealed intraocular pressures of 14 and 17 in the right and left eyes, respectively. Fundoscopic examination revealed no papilledema with symmetric cup to disc ratios of 0.3. Except for the abnormalities mentioned, clinical examination of cranial nerves II–XII was unremarkable. Neurological examination further revealed normal tone and motor strength, 2+ reflexes at patellae and biceps, and downgoing Babinski on the right and equivocal on the left. No dysmetria was present on finger to nose testing. Rapidly alternating movement testing was normal. Gait was normal.

Rabin: A Case Report of Nystagmus with Acute Comitant Esotropia Secondary to Heroin Withdrawal: A Novel Presentation

Because of the coexistence of nystagmus with acute onset esotropia, the patient was admitted for a rapid workup to rule out intracranial pathology [1]. During this admission, brain MRA and MRI with and without gadolinium were unremarkable. Lyme titer and VDRL were negative. Blood chemistry and CBC were unremarkable.

Topical 2% pilocarpine was used once to attempt to alleviate the patient's symptoms, but it resulted in blurred vision and did not help with diplopia. Wu and Satta [2] demonstrated that pilocarpine may be able to help alleviate esotropia at near by inducing myopia. Similar to wearing a pair of reading glasses, this would decrease accommodative esotropia if present and improve the deviation. The patient reported improvement in double vision when either eye was occluded and elected to wear an eye patch.

The patient was discharged with a diagnosis of acute comitant esotropia secondary to heroin withdrawal. At a follow-up examination 11 days after the onset of symptoms, the esotropia was stable. Thirty-eight days after the onset of symptoms, the alternating esotropia improved, measuring 25 prism diopters. At 68 days, the patient reported asthenopia, and alternation was replaced by 25 diopters of right esotropia. At 110 days, seven diopters of esophoria were present, tropia was absent, and the patient was asymptomatic. The patient believes her symptoms resolved at day 76. At 192 days esophoria remained stable, and the patient remained asymptomatic.

Discussion

Comitant esotropia in heroin withdrawal is a rarely reported and poorly understood phenomenon. Most reports show a mild deviation, while our patient showed a severe deviation of 40 prism diopters and required 45 prism diopters to demonstrate stereopsis [2–6]. Our patient maintained excellent follow-up allowing for precise documentation of her course, which is infrequently the case with drug-abusing patients. First accounts of this phenomenon were documented by Ream et al. [7] in soldiers returning from Vietnam, but little attention was paid to the differentiation of blur from diplopia. Sixty heroin sniffers were monitored during 14 days of withdrawal, and 10% demonstrated either blur or diplopia. When 50 of the sniffers were questioned regarding prior withdrawal episodes, 30% said they had experienced either blur or diplopia.

Firth et al. [5] studied orthoptic status before and after heroin withdrawal in patients undergoing a 5-day detoxification program. Of the 69 patients seen, 50 experienced visual phenomena on withdrawal. Of the 50, 17 had blur only, 19 had diplopia and blur, and 14 had diplopia only. The main finding of the study was that after 5 days, there was a significant change in horizontal deviation in the eso direction at distance. At distance, prior to detoxification, 58 patients demonstrated exo deviations and 9 demonstrated eso deviations. After detoxification, 14 showed exo deviations and 39 demonstrated eso deviations. It has been previously reported in 2 cases that exotropia ensued on heroin use [8]. The earliest that patients have been studied is either while intoxicated or during withdrawal.

While a decrease in acuity has been shown with heroin withdrawal, refractive status changes during intoxication and withdrawal are unclear. Fraunfelder and Meyer [9] state that accommodative effort is decreased during intoxication and withdrawal. However, Firth et al. [5] showed no change in refractive status. Kowal et al. [6] suggest that a hyperopic cycloplegic refraction is a risk factor for development of esotropia with heroin withdrawal. This suggests that accommodation and accommodative convergence may be involved.

Firth et al. [5] suggest that opioid receptors in retinal ganglion cells or in the midbrain may be responsible for development of esotropia. Furthermore, they propose that there may

be disequilibrium between convergence and divergence on withdrawal of opioids. The chronic use of heroin and its effects on blur may induce disequilibrium of the brain's established fusion ability in response to a given degree of accommodation. If a previously defined level of accommodation produced a given amount of convergence, this same level of accommodation may now produce a greater convergence resulting in esotropia.

Kowal et al. [6] interviewed physicians treating heroin addicts and concluded that rapid withdrawal from heroin using naltrexone resulted in a greater incidence of strabismus compared to withdrawal using methadone. They suggested that physical and psychological shock could weaken the motor fusion system, similar to the type II comitant convergent strabismus of the Franceschetti type [1]. Similarities between our patient and the type II comitant convergent strabismus of the Franceschetti type include the presence of a physical or psychological shock (which both occur during withdrawal) [10], mild hyperopia, and the ability to reproduce stereopsis with prisms. All three were present in our patient. In addition, she suffered the recent demise of her stepbrother, which was another source of psychological shock. Nystagmus, which our patient demonstrated, however, is not known to be present in type II comitant convergent strabismus.

It is well known that opioids cause activation of the pupillary sphincter and that withdrawal causes mydriasis [9, 11]. Kowal et al. [6] propose the mechanism of reversible disuse atrophy of the motor fusion system. They state that heroin-induced miosis produces a pinhole effect resulting in a less than normal requirement for accommodation, accommodative convergence, and motor fusion. Heroin withdrawal, especially with naltrexone, causes mydriasis with blur and a rapid need for accommodation, convergence, and fusion, which are unavailable due to reversible disuse atrophy of the motor fusion system, thus resulting in comitant esotropia [6].

The exo tendency seen with heroin intoxication is likely linked to the esotropia seen with withdrawal. This is not surprising given the agonist-antagonist effects typically seen with other medications on intoxication versus withdrawal. This suggests that there are saturated opioid receptors responsible for the exo tendency and unsaturated opioid receptors responsible for the eso tendency. This idea is touched on by Firth et al. [5] with regard to retinal nerve fiber layer or midbrain opioid receptors which may be responsible.

This author would like to propose a novel hypothesis for the mechanism of heroin withdrawal esotropia: The near triad is composed of pupillary constriction, accommodation, and vergence. A feedback loop exists between accommodation and vergence to attain a fused image [12–14]. Disparity and blur drive accommodation and vergence. If blur is induced, either because the lens does not accommodate properly or by an alternate neurologic mechanism in heroin intoxication and withdrawal, it will induce abnormal vergence based on the intimate link between blur, accommodation, and vergence resulting in comitant esotropia.

Gaze-evoked nystagmus is a well-known feature of various drug intoxications. Our patient's nystagmus was likely due to a residual effect of withdrawal on one of the crucial structures for gaze holding. These structures include the nucleus prepositus hypoglossi and the medial vestibular nucleus for horizontal fixation, and the interstitial nucleus of Cajal for vertical fixation [14]. It is less likely that these nuclei were affected and more likely that the vestibulocerebellum alone was responsible for these findings since involvement of the vestibulocerebellum could cause both horizontal and vertical gaze-evoked nystagmus [14].

Rabin: A Case Report of Nystagmus with Acute Comitant Esotropia Secondary to Heroin Withdrawal: A Novel Presentation

Conclusion

Nystagmus with acute-onset esotropia is a worrisome finding and warrants a thorough workup [1]. Of most concern are organic lesions, such as stroke, tumors or other mass lesions of the supratentorium or posterior fossa, hydrocephalus, multiple sclerosis, and myasthenia gravis [1]. Being able to reproduce stereopsis with prisms, as was done in our patient, lessens the likelihood of an intracranial lesion being present [1]. It remains possible that our patient has myasthenia gravis or multiple sclerosis, but she has not demonstrated other signs of these disorders. We will continue to monitor her for any future symptoms.

Statement of Ethics

The authors have no ethical conflicts to disclose.

Disclosure Statement

There are no conflicts of interest to declare.

References

- 1 Hoyt CS, Good WV: Acute onset concomitant esotropia: when is it a sign of serious neurological disease? *Br J Ophthalmol* 1995;79:498–501.
- 2 Wu Z, Sadda S: Acute concomitant esotropia during heroin detoxification. *Ann Acad Med Singapore* 2008;37:84–85.
- 3 Czyz CN, Piehota PG, Strittmatter AM: Acute onset esotropia after heroin withdrawal. *Am J Emerg Med* 2015;33:598.e1–e2.
- 4 Firth AY: Heroin withdrawal as a possible cause of acute concomitant esotropia in adults. *Eye* 2001;15:189–192.
- 5 Firth AY, Pulling S, Carr MP, Beaini AY: Orthoptic status before and immediately after heroin detoxification. *Br J Ophthalmol* 2004;88:1186–1190.
- 6 Kowal L, Mee JJ, Nadkarni S, Kalff S, Kozminsky M: Acute esotropia in heroin withdrawal: a case series. *Binocul Vis Strabismus Q* 2003;18:163–166.
- 7 Ream MG, Robinson NW, Richter RW, Hegge FW, Holloway HC: Opiate dependence and acute abstinence; in Richter RW (ed): *Medical Aspects of Drug Abuse*. Hagerstown, Harper & Row, 1975, pp 81–123.
- 8 Sutter FK, Landau K: Heroin and strabismus. *Swiss Med Wkly* 2003;133:293–294.
- 9 Fraunfelder FT, Meyer SM: *Drug-Induced Ocular Side Effects and Drug Interactions*. Philadelphia, Lea & Febiger, 1982.
- 10 Burian HM, Miller JE: Comitant convergent strabismus with acute onset. *Am J Ophthalmol* 1958;45:55–64.
- 11 Robinson MG, Howe RC, Varni JG, Ream NW, Hegge FW: Assessment of pupil size during acute heroin withdrawal in Viet Nam. *Neurology* 1974;24:729–732.
- 12 Fincham EF, Walton J: The reciprocal actions of accommodation and convergence. *J Physiol* 1957;137:488–508.
- 13 Judge SJ: How is binocularity maintained during convergence and divergence? *Eye* 1996;10:172–176.
- 14 Zee DS, Leigh RJ: *The Neurology of Eye Movements*, ed 3. New York, Oxford University Press, 1999, p 646.

Rabin: A Case Report of Nystagmus with Acute Comitant Esotropia Secondary to Heroin Withdrawal: A Novel Presentation



Fig. 1. Extraocular movements at initial presentation demonstrating 40 prism diopters of comitant alternating esotropia.