CASE REPORT

Bilateral Tonic Pupils in the Absence of Pupillary Cholinergic Supersensitivity

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ABSTRACT

We report a 24-year-old woman with a presenting complaint of bilateral dilated pupils. The pupils were found to be dilated in bright and dim room lighting with minimal light reaction, showed an accommodation response, but did not demonstrate cholinergic supersensitivity. Neurological examination and neuro-imaging of the patient were normal. Syphilis serology was negative. This case emphasises that tonic pupil may be found in the absence of pupillary cholinergic supersensitivity.

KEYWORDS: cholinergic supersensitivity; tonic pupil

INTRODUCTION

Tonic pupil is characterised by impaired light reaction, light-near dissociation, tonic constriction and redilation, segmental palsy of the sphincter pupillae, and cholinergic supersensitivity.¹ We report an unusual presentation of a patient with bilateral tonic pupils.

CASE REPORT

A 24-year-old woman referred to our ophthalmology clinic with a complaint of bilateral dilated pupils that had been present for about 5 years. Her past medical and ocular history was unremarkable. Visual acuity was 10/10 bilaterally. The cornea, lens, vitreous, optic nerve, macula, and peripheral retina were entirely normal. Intraocular pressure was 14 and 13 mm Hg on the right and left eye, respectively. Extraocular motility was full. The pupils were found to be dilated in bright (Figure 1a, b) and dim (Figure 2a, b) ambient lighting and showed only a minimal reaction to light and

but did respond to accommodation (Figure 3). With accommodative effort, the pupils constricted slowly: when accommodative effort was relaxed, the pupils redilated gradually over approximately 12 seconds (tonic response to accommodation). On slit-lamp examination, segmental vermiform iris movements were observed. Pilocarpine 0.125% was instilled into both eyes to demonstrate cholinergic supersensitivity

FIGURE 1 Bright room condition: (a) right pupil; (b) left pupil.

FIGURE 2 Dim room condition: (a) right pupil; (b) left pupil.

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FIGURE 3 Accommodation response.

FIGURE 4 Cholinergic response: (a) right pupil; (b) left pupil.

and to confirm the diagnosis of tonic pupil. The pupils were rechecked after 60 minutes but no constriction was observed. After the instillation of 1% and then 2% pilocarpine sequentially, we observed a clear but not very pronounced response (Figure 4). Laboratory examination showed no significant abnormalities and syphilis serology was found to be negative. Neurological examination of the patient and magnetic resonance imaging (MRI) of the head and orbit showed no abnormality. The pupil diameters measured in different conditions are shown in Table 1.

DISCUSSION

Cholinergic supersensitivity, a sign of the tonic pupil, is to be expected on the basis of what is known about denervation supersensitivity in other systems: that is, when a weak solution of pilocarpine (0.125% or less) is applied, the tonic pupil constricts more than the normal pupil due to denervation supersensitivity. In our patient, we observed bilateral dilated pupils, minimal light response, tonic accommodation response but lack of cholinergic supersensitivity. Due to the absence of other neurologic

TABLE 1 Pupil diameters (mm) in different conditions.

	Right pupil	Left pupil
Dim lighting	6.0	5.8
Bright lighting	5.7	5.5
Pilocarpine 0.125%	5.7	5.5
Pilocarpine 2%	4.2	4.0
Accommodation	4.0	3.8

and ocular pathology, a diagnosis of bilateral tonic pupils without a cholinergic supersensitivity was made.

Thompson pointed out that cholinergic supersensitivity is a characteristic, but not pathognomonic sign of tonic pupil.² Kardon et al. analysed the signs of denervation and reinnervation of individual segments of the iris sphincter in patients with Adie syndrome. They concluded that iris segments that become densely reinnervated appeared to lose cholinergic supersensitivity.³ Possibly, our patient has this type of reinnervation of iris sphincter muscle, explaining the lack of cholinergic supersensitivity.

Neither is cholinergic supersensitivity specific to post-ganglionic denervation. Jacobson and Vierkant compared the pupilloconstriction seen with 0.1% pilocarpine in 11 patients with pupil-involving oculomotor nerve palsy (preganglionic denervation) with that seen in 11 patients with Adie tonic pupil (postganglionic denervation). The degree of cholinergic supersensitivity was similar in the two groups.⁴

Furthermore tonic pupil without cholinergic supersensitivity should be differentiated from congenital mydriasis, which is described as a very rare condition and explained as a result of isolated aplasia of the iris sphincter muscle. Congenital mydriasis presents with lack of pupillary constriction to both light and accommodation in contrast to the tonic pupil.⁵ In our patient, we observed pupil constriction on near effort, meaning that the iris sphincter muscle was present and functional. Dorsal midbrain syndrome was excluded in view of the normal MRI of the cranium, lack of any abnormality in extraocular movements, lid retraction, paralysis of convergence, and of convergence-retraction nystagmus.

In conclusion, tonic pupil may be seen without cholinergic supersensitivity and this possibility should be kept in mind in the differential diagnosis of pupillary light-near dissociation.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Note: Figures 1-4 of this article are available in colour online at www.informahealthcare.com/oph

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