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SHORT COMMUNICATION

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The effect of nasolacrimal occlusion on drug-induced mydriasis

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Abstract ● Background: Nasolacrimal occlusion has been shown to improve the efficacy of some topically applied ocular drugs. The aim of this study was to investigate the effect of nasolacrimal occlusion on tropicamide-induced mydriasis. ● Methods: We compared pupillary dilatation by 0.125% tropicamide with and without nasolacrimal occlusion in 40 healthy volunteers. ● Results: Analysis of variance with repeated measures failed to show any advantage due to nasolacrimal occlusion in drug-induced mydriasis. ● Conclusion: Nasolacrimal occlusion did not increase the mydriasis obtained with 0.125% tropicamide.

Introduction

Nasolacrimal occlusion is often recommended as a means of improving the efficacy and systemic safety of topically applied ocular drugs [1–9]. In this technique, digital pressure is made against the nasal margin of the eye, over the medial canthus, attempting to close the periphery of the nasolacrimal drainage system. Prevention of systemic absorption and prolongation of corneal-drug contact time with resultant improved bioavailability are often claimed in the literature. The prevention of systemic absorption of routinely used ophthalmic drugs that have systemic side effects seems a reasonable goal and has indeed been studied and proved possible [1–7]. Concerning improved bioavailability, the results reported are not equivocal. Only two studies investigated the intraocular concentration of topically applied drugs using nasolacrimal occlusion [1, 5]. In these studies, nasolacrimal occlusion was shown to increase the duration of stay of fluorescein in the anterior chamber by 100% [1], and to increase average aqueous humor timolol concentration by 70% [2]. However, in the clinical studies, the results are not as convincing. Zimmerman and colleagues recently found that the hypotensive effect of timolol and carbachol was increased after nasolacrimal occlusion. However, the hypotensive effect of epinephrine and dipivefrin was not. Concerning pilocarpine, an increased hypotensive effect after nasolacrimal occlusion was found only for low concentrations [7–9]. Since the data concerning the improved bioavailability of ocular drugs due to nasolacrimal occlusion are conflicting, we decided to investigate this topic further. The aim of this study was to establish the effect of nasolacrimal occlusion on a different parameter, namely drug-induced mydriasis.

Patients and methods

The experiment was designed to study the effect of nasolacrimal occlusion on pupillary diameter following the application of tropicamide, a lipophilic anticholinergic agent. The study group included 40 healthy volunteers whose mean age was 70 years (range 41–90 years), who attended the ophthalmological clinic for refraction. Tropicamide 0.125% was used. This weak concentration was selected in order to prevent the saturation of intraocular receptors for the drug and had previously been shown to be as effective as the commercially available 0.5% tropicamide [10]. Pupillary diameter was measured under constant illumination with the pupillometer of the Goldman perimeter. Nasolacrimal occlusion was applied in one eye, while the contralateral eye served as a control. A masked double-blind design was used: Drops were given and nasolacrimal occlusions were performed by the same person, and all pupillary diameter measurements were performed by a different person, who was unaware of the eye in which nasolacrimal occlusion had been employed. Pupillary diameter of both eyes was determined before application of the drug. One drop was instilled in the inferior cul-de-sac of each eye after a slight eversion of the lower eyelid. Instillation was followed by nasolacrimal occlusion for 3 min in

one eye only. Pupillary diameter in both eyes was determined at 20, 40 and 60 min following drug instillation. The power of the test was calculated to be 0.999 to detect a change of 1 mm in pupillary diameter difference and 0.997 to detect a change of 0.5 mm in pupillary diameter difference for a group of 40 patients.

Results

The mean pupillary diameter before instillation of drops was 2.73 ± 0.30 mm. The mean pupillary diameter after 20 min in the eyes in which nasolacrimal occlusion was performed was 3.93 ± 0.98 mm, compared with 4.12 ± 0.86 mm in the eyes in which nasolacrimal occlusion was not performed. Forty minutes after instillation, the mean pupillary diameter was 4.88 ± 1.21 mm in the eyes in which nasolacrimal occlusion was performed and 4.78 ± 0.90 mm in the eyes in which nasolacrimal occlusion was not performed. Sixty minutes after instillation, the corresponding mean pupillary diameters were 4.88 ± 1.21 mm and 5.10 ± 0.97 mm. Analysis of variance with repeated measures failed to show any difference in mydriatic effect between the two eyes ($P = 0.245$). Paired t-tests also failed to reveal any difference in the mydriatic effect at all times measured (at 20 min $P = 0.397$, at 40 min $P = 0.163$, at 60 min $P = 0.297$).

Discussion

Patients using topical ophthalmic drugs are often advised to perform nasolacrimal occlusion in order to improve the local activity of the drug and to prevent systemic side effects. In the present study we evaluated the effect of nasolacrimal occlusion on a mydriatic drug by measuring its direct effect, namely pupillary dilation. We demonstrated that this procedure does not improve the local activity of 0.125% tropicamide. If nasolacrimal occlusion increases the effect of the drug, it is reasonable to expect an increase in pupillary dilatation, since, as demonstrated by us previously, one drop of 0.125% tropicamide does not achieve the maximal effect of this preparation [11]. However, in the present study statistical analysis failed to show any difference in mydriatic effect between the eyes in which nasolacrimal occlusion was performed and the control eyes ($P = 0.245$).

There seems to be no doubt that nasolacrimal occlusion reduces the systemic absorption and side effects of topically instilled eye drops. The effect of nasolacrimal occlusion on the local activity of eye drops seems to vary from one drug to another. Our study demonstrates that nasolacrimal occlusion does not increase the effect of 0.125% tropicamide on the pupil.

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