Original Article

Comparison of the Mydriatic Effects of Mydrin-P and Compound Tropicamide in the Screening of Retinopathy of Prematurity

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Abstract

Purpose: To observe and compare the effects of pupil dilation between Mydrin-P and compound tropicamide in the screening of retinopathy of prematurity.

Methods: The right eyes of premature infants received Mydrin-P eye drops as the treatment group, whereas the left eyes were administered with compound tropicamide as the control group. The eye drops were delivered every 5 min for three times. The pupil size was observed and recorded at 10, 15, and 20 min after administering mydriasis.

Results: The mean pupil diameter did not significantly differ between the treatment and control groups at 10 (6.24±0.72 mm vs. 6.24±0.68 mm, t=0.00, P=1.00), 15 (6.83±0.55 mm vs. 6.78±0.54 mm, t=1.75, P=0.083) or 20 min (7.22±0.40 mm vs. 7.15±0.50 mm, t=1.62, P=0.109), respectively. However, the mean pupil size at any two time points significantly differed in both groups (all P<0.001).

Conclusion: Both Mydrin-P and compound tropicamide exert similar clinical efficacy in the screening of retinopathy of prematurity. The most appropriate time for screening was at 20 min after mydriasis. (***Eye Science 2014; 29:219-222***)

Keywords: mydrin-P; compound tropicamide; mydriasis; retinopathy of prematurity

Introduction

The Retcam 3 wide-angle digital retinal imaging system has been used for observation and accurate recording of infant retinal images. Retcam 3 has also been widely applied in recent screenings of retinopathy of prematurity (ROP). This ROP screening by Retcam3 should be performed under mydriasis, which is commonly performed using Mydrin-P and compound tropicamide eye drops in clinical settings. Although both Mydrin-P and compound tropicamide contain similar pharmacological ingredients, the mydriasis effect and systemic influence of these eye drops during the screening of ROP have not been established. The present study adopted a self-control method to conduct a statistical comparison of the clinical effects of these two mydriatics.

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Subjects and methods

Study subjects

In total, 88 premature infants (176 eyes) undergoing ROP screening at our hospital between December 2012 and June 2013 were enrolled in this study. The enrolled subjects were 49 male and 39 female infants, aged 26-37 weeks (excluding 37 weeks), (33±4 weeks on average). Thirty-six cases were complicated with newborn jaundice, 57 were subjected to oxygen inhalation, 23 had pneumonia, and 4 were undergoing mechanical ventilation. The first examination was performed at the age of 3-5 weeks. Informed consents were obtained from the parents of the premature infants. The right eye of each infant was assigned to the treatment group and administered with l0 ml of Mydrin-P eye drops containing 50 mg tropicamide and 50 mg phenylephrine hydrochloride (Santen Pharmaceutical Co., Ltd, Japan). The left eye, as the control, was administered with 5 ml of compound tropicamide eye drop containing 25 mg tropicamide and 25 mg phenylephrine hydrochloride for mydriasis (Sinqi Pharmaceutical Co.,

Ltd, China). In both groups, the eye drops were administered every 5 min for 3 times, 1 drop each time, into the conjunctival sac. The lacrimal sac was pressed after eye drop delivery. The nurses were instructed to administer the eye drop steadily and gently and to avoid contaminating the eye drop by touching the eyelid or eyelashes. The pupil diameter was measured at 10, 15, and 20 min after eye drop administration. Fundus examination was conducted using the Retcam 3 system. The following cases were excluded from this study: premature infants complicated with iris neovascularization, congenital leukoma, persistent pupillary membrane, or congenital cataract, and those inappropriate for pupil dilation.

Examination and record

The diameter (mm) and shape of the pupils were measured with a Haab scale under normal illumination by the same physician. The mean value was calculated from three repeated measurements.

Statistical analysis

SPSS 19.0 statistical software was used for data analysis. The data were expressed as $\bar{x}\pm SD$. Measurement data between the treatment and control groups and at different time points in each group were analyzed by paired sample *t*-test. A value of $P<0.05$ was considered statistically significant.

Results

The pupil diameter did not significantly differ between the Mydrin-P and compound tropicamide groups at 10, 15, and 20 min after mydriasis, as illustrated in Table 1.

The pupil diameter measured at any two time points in each group significantly differed (all $P<0.001$), as shown in Table 2. The pupil diameter reached 7 mm at 20 min after eye drop administration in both groups, and was then eligible for ROP screening.

None of the premature infants presented with bradycardia, declined respiratory rate, rash, or other adverse events.

Discussion

The cause of retinopathy of prematurity (ROP) is considered to be disorganized growth and proliferation of retinal blood vessels, which may result in fundus lesions of varying degree. ROP is the primary eye disease leading to blindness. Preterm babies with low birth weight are at a risk for ROP. Therefore, screening for early-stage ROP is necessary and premature infants should undergo interventional therapy aimed at effectively reducing the incidence of adolescent and childhood blindness. The peripheral retina should be carefully observed during ROP screening of premature infants.

Due to poor cooperation of these young patients, the diagnosis of ROP can be easily missed when the pupil is not fully dilated, thereby leading to suboptimal timing of clinical treatment. Mydrin-P and com pound tropicamide eye drops, which share similar pharmacological ingredients and effects, are commonly used in clinical settings. Previous studies mainly compared these two mydriatics in terms of the intervals and times of medicine administration and

Table 1 Comparison of pupil diameter at different time points between the Mydrin-P and compound tropicamide groups

Side	Eye drop	10 min			15 min			20 min		
		Pupil diameter(mm)	*t* value	*P* value	Pupil diameter(mm)	*t* value	*P* value	Pupil diameter(mm)	*t* value	*P* value
Right	Mydrin-P	6.24± 0.72			6.83± 0.55			7.22± 0.40		
Left	Compound tropicamide	6.24± 0.68	0	1.00	6.78± 0.54	1.75	0.083	7.15± 0.50	1.62	0.109

Table 2 Comparison of pupil diameter at any two time points in each group

	Two time points	Difference in pupil diameter (mm)	*t* value	*P* value
Mydrin-P group	10 min & 15 min	−0.59± 0.44	−12.63	0.000
	15 min & 20 min	−0.39± 0.37	−9.81	0.000
	10 min & 20 min	−0.98± 0.62	−14.92	0.000
Compound tropicamide group	10 min & 15 min	−0.54± 0.46	−11.10	0.000
	15 min & 20 min	−0.38± 0.59	−5.98	0.000
	10 min & 20 min	−0.91± 0.74	−11.66	0.000

clinical efficacy during cataract surgery. Lu et al. found a higher effect of mydriasis with compound tropicamide when it was administered every 5 min for three times rather than delivered every 10 min for three times. The total time of eye drop administration was equally reduced[1]. For this reason, the eye drops were delivered every 5 min for three consecutive times in the present study.

Preoperative and intraoperative mydriasis efficacy did not significantly differ between the compound tropicamide and Mydrin-P treatments, whereas the preoperative pupil diameter was longer during Mydrin-P administration than during compound tropicamide delivery[2]. However, the mydriasis efficacy of these two mydriatics during ROP screening has rarely been reported.

Zhu et al. administered compound tropicamide in the left eyes twice and in the right eyes three times in premature infants of low and high gestational age. They found that the diameter of the bilateral pupils did not significantly differ at 45 and 60 min after mydriasis, whereas the pupil diameter was larger in the right eye than in the left eye at 90 min following mydriasis[3]. In another study, the right eyes of premature infants were given mydriatics (0.2% cyclopentolate and 1% phenylephrine eye drop) three times and the fellow eyes were treated 1 or 2 times. The pupil diameter did not significantly differ at 0, 90, and 120 min after mydriasis, whereas the pupil diameter was the largest at 45 min in the group receiving three treatments. Therefore, the recommended administration of eye drops for ROP screening is a single administration of one drop and then to measure the pupil diameter at 90 min after mydriasis[4]. However, this is not feasible in clinical practice due to the long wait time. Therefore, triple administration of mydriatic eye drops should be highly recommended in China. For this reason, the eye drops were administered every 5 min for three times and the total administration time was only 20 min. The pupil diameters of the patients in both groups exceeded 7 mm and satisfied the requirement for fundus examination. The pupil dilation did not considerably differ between the two groups at 10 min after administration. The pupil diameter at 15 and 20 min was slightly larger after Mydrin-P administration than after compound tropicamide administration but the difference was not statistically significant.

Most premature infants have complications such as newborn jaundice, pneumonia, or oxygen inhalation. The influence of mydriatics upon systemic conditions was minimized in the present study by treating both the left and right eyes with eye drops as a self-control clinical trial. Previous studies reported that compound tropicamide eye drops may lead to apnea and bradycardia in premature infants[5], possibly as a result of the phenylephrine in the mydriatics or allergic reactions[6]. In the present study, the nurses were required to press the lacrimal sac after eye drop administration and closely observe the infant's facial and lip color, heart rate and respiration. However, other studies have demonstrated that compared with the effect of medication, the procedures of ROP screening (especially the eye speculum) were more likely to change the blood oxygen saturation and pulse of premature infants[7]. In this clinical trial, ROP screening was performed strictly according to the standard operating procedures[8]. No adverse events related to mydriatics were observed in these premature infants.

Taken together, the data presented here confirm that compound tropicamide and Mydrin-P have similar effects on pupil dilation and clinical safety when administered every 5 min for three times during ROP screening.

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