Comparison of mydriatic effect and irritative symptoms between mydriatic drug-soaked sponge packing and conventional instillation

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Objective: To evaluate the pupil diameter and irritative symptom by the using of mydriatic drug-soaked sponge packing versus conventional instillation technique in the patients who need fundus examination.

Methods: With 40 patients, were dilated pupils by applying mydriatic drug-soaked sponge in one eye and using conventional technique in another eye. The soaked sponge were packed for 20 mins, pupils'diameter was checked every 10 mins for 3 times, and recorded irritative symptom in 30 mins.

Results: The mean pupil diameter after mydriatic drugs applying at 10, 20 and 30 minutes were 3.2 ± 1.0, 5.5 ± 1.3 and 7.0 ± 1.1 mm. by drug soaked sponge technique versus 3.2 ± 0.8, 5.4 ± 1.1 and 6.5 ± 1.0 mm by conventional technique respectively (p=0.661, 0.682, 0.974). The irritative symptom score was 4.9 ± 2.6 in mydriatic drug soaked sponge group and 3.0 ± 2.4 in conventional group (p=0.0006).

Conclusion: The mydriatic drug soaked sponge technique can provide a similar mydriatic effect to the conventional instillation technique. The sponge technique uses less number of staff and their effort. However this technique can cause significant irritation or foreign body sensation in some patients.

Conflicts of interest: The authors report no conflicts of interest.

Keywords: mydriatic, cataract, intraocular pressure, soaked-sponge technique

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Introduction

In general, the influence of light on human eyes affects pupil reaction; pupil diameter will constrict to approximately 2-3 mm after exposure to light. Patients who require fundus examinations or cataract surgery should have dilated pupil diameters up to approximately 7mm.[1,2] Currently, the general method of pupil dilation consists of 2 types of topical eye drops; 1%Tropicamide and 10% Phenylephrine. The majority of methods for the conventional technique is by instilling 1% Tropicamide and 10% Phenylephrine into the lower conjunctival fornix; or alternately, by instilling every 5 minutes until 30 minutes[3,4], until the pupil diameter is dilated to 7-9 mm. The possible side effects of 1%Tropicamide eye drops are high intraocular pressure, dry mouth, blurred vision, sensitivity to light, tachycardia and headache. Possible side effects of 10%Phenylephine eye drops are tachycardia, high blood pressure, headache and dizziness.[3,4] Nevertheless, the conventional technique for pupil dilation requires multiple alternating eye drops of 1%Tropicamide and 10%

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Phenylephrine, applied every 5 minutes; so the patients may frequently feel irritation in their eyes. Moreover, numerous staff or nurses involved in several steps of applying eye drops may be a cumbersome process with potential unexpected human errors. Thus the purpose of this study was to evaluate the pupil diameter and irritative symptoms of mydriatic drug-soaked sponge packing versus conventional instillation technique in the patients who need fundus examination.

Methods

This study was reviewed and approved by Thammasat University Ethics Committee for human research. The sample size was calculated from formula which estimated the number of patients per treatment group to be 40.5 The patients were recruited from the outpatient department of Thammasat University Hospital from October 2017 to January 2018. Written informed consent was obtained from all patients. Inclusion Criteria: Patients aged 18 to 80 years old who require pupil dilation for fundus examination. Exclusion Criteria: Patients allergic to mydriatic drugs, previous intraocular surgery, ocular trauma, abnormal iris, previous uveitis, history of closed angle glaucoma, intraocular pressure more than 21 mmHg, abnormal size of pupil diameter, pupil irregularity, blindness, unconsciousness and uncooperative patients. The patients were randomized to either conventional instillation or mydriatic soaked sponge at the lower conjunctival fornix in one eye and the other technique in the other eye. Measure the size of pupils' diameter in horizontal line with slit lamp.

Soaked-sponge (polyvinylalcohol) technique:

a. Cut sponge size to 2 mm x10 mm x 3 mm

b. One drop of 1% Tropicamide, followed by 1 drop of 10% Phenylephrine, 3 times on the sponge

c. One drop of 0.5%Tetracaine at the lower conjunctival fornix

d. Place the mydriatic drug-soaked sponge on the lower conjunctival fornix, then remove it after 20 minutes.

e. Measure pupil diameter at 10, 20 and 30 minutes

Conventional technique:

a. One drop of 0.5%Tetracaine at the lower conjunctival fornix

b. One drop of 1%Tropicamide at the lower conjunctiva then after 5 minutes, one drop of 10% Phenylephrine at the lower conjunctiva. Alternating between these two drugs every 5 minutes for 20 minutes.

The irritative symptoms score were monitored after completing both techniques which scale from 1 to 10 (10 being the worst). In the evaluation of this study; a comparison of the mydriatic effect and irritative symptoms of lower conjunctival fornix between using mydriatic drug soaked sponge versus conventional technique. The data were analysed using a t-test to compare the irritative symptom of both groups statistical significant was taken as $p<0.05$.

Results

Forty patients were recruited in this study. The proportion of gender and mean age were similar in both groups (table 1).

The mean pupil diameter at baseline was 2.0 ± 0.3 in both groups and after mydriatic drugs application at 10, 20 and 30 minutes were 3.2 ± 1.0, 5.5 ± 1.3 and 7.0 ± 1.1 mm respectively. Mean pupil diameter for soaked sponge technique was 3.2 ± 0.8, 5.4 ± 1.1 and 6.5 ± 1.0 mm respectively (p= 0.661, 0.682, 0.974) (table 2)(figure 1).

The proportion of pupils dilated greater than 7mm at 20 and 30 minutes were 5.13% and 51.35% in the drug soaked sponge technique group and 2.63% and 41.03% in the conventional technique group (p=0.718 and 0.822) respectively (table 3)The irritative symptom scores were 4.9 ± 2.6 and 3.0 ± 2.4 in mydriatic drug soaked sponge group and conventional group respectively (p=0.0006). (table 4)

Table 1: Demographics comparison mydriatic drug soaked sponge technique versus conventional technique.

Variables	Drug soaked sponge technique(N=40)	Conventional technique (N=40)
Gender	Male : 35.0% Female : 65.0 %	Male : 35.0% Female : 65.0 %
Age (Mean ± SD)	58.8 ± 10.5	58.8 ± 10.5

Table 2: Diameter pupil diameter average by technique and time

Time (minute)	Mean pupil diameter (mm) ± SD		*P*-value
	Mydriaticdrugsoaked sponge technique	Conventional technique	
0	2.0 ± 0.3	2.0 ± 0.3	0.446
10	3.2 ± 1.0	3.2 ± 0.8	0.661
20	5.5 ± 1.3	5.4 ± 1.1	0.682
30	7.0 ± 1.1	6.5 ± 1.0	0.974

Table 3: Comparison mydriatic drug soaked sponge technique versus conventional technique in terms of percentage dilated pupil (≥7mm)

Pupil dilation time (minutes)	Proportion of pupils dilated (≥7mm)		
	Mydriaticdrugsoaked sponge technique	Conventional technique	*P*-value
0	0.00%	0.00%	-
10	0.00%	0.00%	-
20	5.13%	2.63%	0.718
30	51.35%	41.07%	0.822

Table 4: Irritative symptom (score)

Variables	Mydriatic drug soaked sponge technique (Mean ± SD) (N=40)	Conventional technique (Mean ± SD) (N=40)	*P*-value
Irritative symptom (score 1-10)	4.9 ± 2.6	3.0 ± 2.4	0.0006

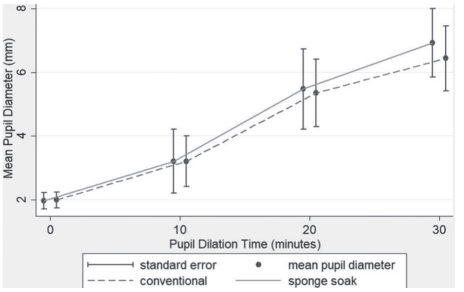

Figure 1: Comparison of mydriatic drug soaked sponge versus conventional technique of pupil dilation.

Discussion

In most cases, patients requiring posterior segment evaluation by fundus exam should have pupil diameters of approximately 7 mm or greater. Typically, the regular dilatation method is the conventional technique of repeating instillations of two mydriatic drugs, however this technique has a high turnover of fluid at cul-de-sac about 16% per minute and then 50% at 4 minutes; thus, the alternating eye drops are essential every 5 minutes. Therefore in this study we used the mydriatic drug soaked sponge placing at the inferior fornix instead of repeating instillation. The type of sponge was polyvinylalcohol (PVA) which constructed from ultra-smooth micro-pore PVA sponge, have ultra-fast wicking action and is suitable for tissue manipulation. In this study, the mean pupil diameter from mydriatic drug soaked sponge technique and conventional technique were not significantly different at 20 and 30 minutes. While the proportion of acceptable pupil diameter (≥7mm)[6-8] at 20 and 30 minutes were also not significantly different. These findings were similar to Dubois et al[6] and McCormick et al[7] that showed no significant difference in providing mydriasis between mydriatic drug soaked depot delivery or pledget soaked placed in the lower fornix and conventional repeated drop administration in patients for cataract surgery. However in our study, the mean pupil diameter and the proportion of acceptable pupil diameter at 30 minutes were slightly higher in mydriatic drug soaked sponge group than the conventional group. This higher effect may be from the increasing contact time of mydriatic drug which soaked by sponge at lower fornix. Nonetheless, these differences were not statistically significant.

The irritative symptom score of mydriatic drug soaked sponge was significantly higher than the conventional technique. Based on patient feedback, they felt that the soaked sponge similar to foreign body in their eyes, however there was no such cases requested for sponge removal before 20 minutes.

The limitation in this study was at 30 minutes the proportion of acceptable pupil diameter (more than 7 mm) was 51.35% by drug soaked sponge technique and 41.07% by conventional technique. Our data has shown that almost half of all eyes could not achieve the acceptable pupil diameter in both techniques. Possibly, the drug may not take full advantage of its maximum effect which may take longer time or additional drug for those patients to have wider pupil diameter.

In conclusion, the mydriatic drug soaked sponge technique can provide mydriatic effects similar to the conventional instillation technique. The sponge technique uses less staff and can improve the efficiency of any clinical setting. Nevertheless, this technique can cause significant irritation or foreign body sensation in some patients.

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