



THE EFFECTS OF DIFFERENT PHYSICAL PROPERTIES OF ARTIFICIAL TEARS ON SUBJECTIVE OCULAR SENSATION

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INTRODUCTION

- Physical properties of artificial tears such as viscosity and pH is influenced by the composition used in its production and being considered as one of the key factors in the formulation of artificial tears as it can affect the effectiveness of the product.
- More viscous artificial tears are more effective in relieving the ocular discomfort as it will prolong the residence time due to slower drainage rate of tears from the ocular surface, and also increase in adhesive capacity of macromolecules with the mucin layer^[1].
- However, high viscosity formulation will likely causing ocular discomfort, blurred vision, stickiness and formation of crusty residue after the instillation^[2]. Thus, previous studies suggested that the final viscosity of artificial tears should be <30cP in order to avoid these side effects^[3].
- Other than viscosity, another factor that may affect the ocular sensation after instillation of artificial tears is pH. pH values of artificial tears outside ocular comfort range or deviated far from natural tear pH may cause irritation, stinging sensation or ocular discomfort^[4,5].
- Garcia-Valdecabres et al.^[6] and Tong et al.^[7] in their studies suggested that pH of artificial tears should be in the range of 6.6 to 7.8 pH unit in order to avoid any discomfort after instillation.
- It is very important to make sure the physical properties of artificial tears are at the optimum level as alteration to these factors would compromise patient's compliance and also reduced the bioavailability and efficacy of artificial tears due to excessive tearing which resulted in rapid flushing of the artificial tears instilled^[8].
- In this present study, we aimed to evaluate the participants' subjective response for Systane Hydration preservative (SH) and non-preservative (SHUD), Optive preservative (O) and non-preservative (OUD) in normal and suspected dry eye (SDE) group based on drop comfort after instillation and overall ocular discomfort pre and post-instillation of these artificial tears.

METHODOLOGY

- Sixty eyes of 30 participants (12 male and 18 female) aged 20 to 40, without any ocular pathologies and systemic diseases involved in this study.

Inclusion criteria^[13]:

- Good ocular and general health
- Age between 20-40 years old
- Non-contact lens wearer
- Have no known sensitivity or intolerance to any of the products used in this study

Suspected dry eye (SDE) groups:

OSDI score > 13 (n=15)

Normal group:

OSDI score ≤13 (n=15)

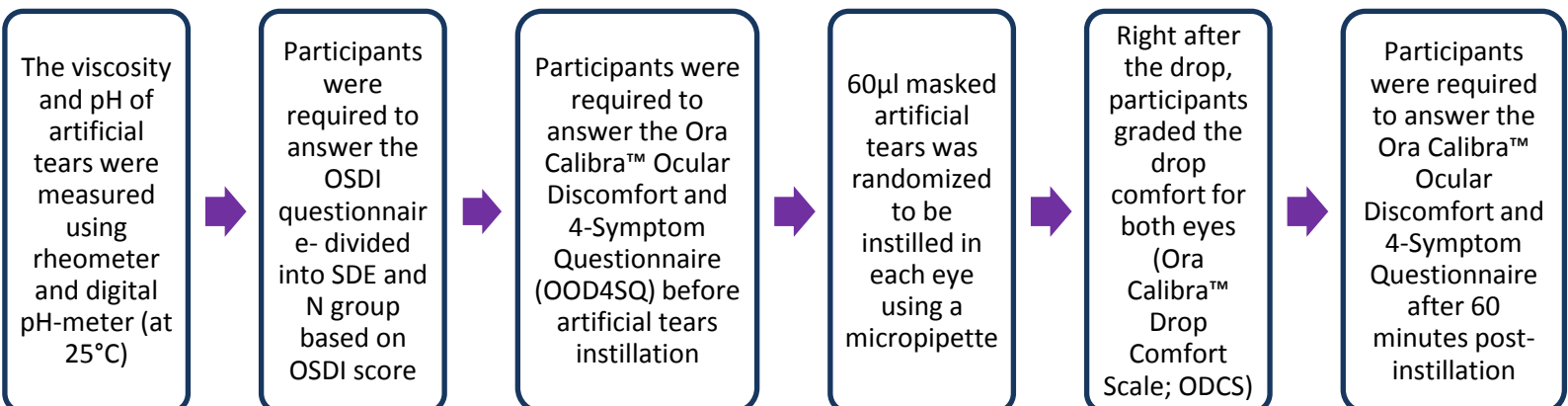


Figure 1 Flow of the study

RESULTS

Table 1 Physical properties of artificial tears studied

Brand name	Lubricant	Preservative	Viscosity (cP)	pH
Systane® hydration	Sodium hyaluronate (SH) 0.1%	Polyquad	26.70	7.85
	Hydroxypropyl Guar (HPG)			
Systane® hydration UD	Sodium hyaluronate (SH) 0.1%	-	32.73	7.74
	Hydroxypropyl Guar (HPG)			
Optive®	Carboxymethylcellulose (CMC) 0.5%	Purite	13.88	7.24
	Glycerin (GLY) 0.9%			
Optive® UD	Carboxymethylcellulose (CMC) 0.5%	-	14.42	7.19
	Glycerin (GLY) 0.9%			

Table 2 Ora Calibra™ Drop Comfort Scale (0-10 scale; 0 = very comfortable, 10 = very uncomfortable)

Group	Artificial tears	Drop comfort score (mean±SD)	p value*
Suspected dry eye (OSDI > 13)	SH	2.00±1.512	0.968
	SHUD	2.07±1.792	
	O	1.80±1.521	
	OUD	1.87±1.642	
Normal (OSDI < 13)	SH	2.27±1.751	0.531
	SHUD	1.47±1.125	
	O	1.93±1.223	
	OUD	2.07±1.870	

*p value analysed using One-way analysis of variance (ANOVA)
Bold values showed the lowest score in each group

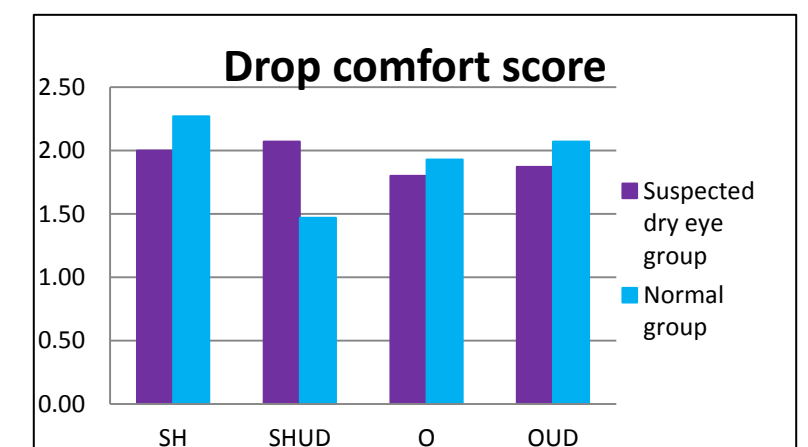


Figure 1 Mean drop comfort score of artificial tears for both groups

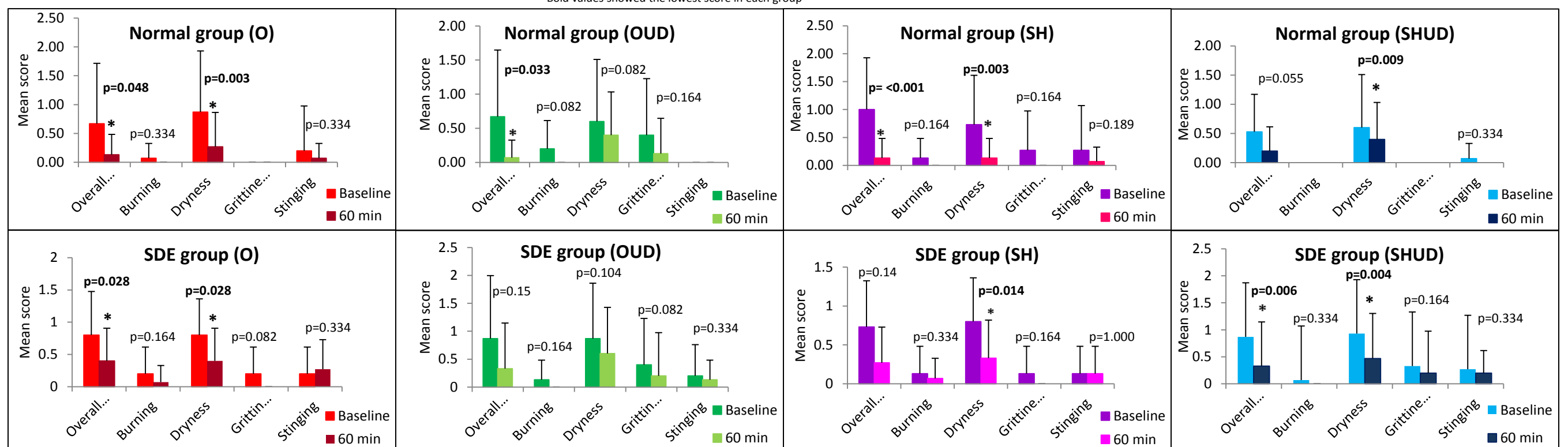


Figure 2 Changes in ocular symptoms (overall discomfort, burning, dryness, grittiness and stinging) from baseline measurement vs. 60 minutes post-instillation of O, OUD, SH and SHUD in suspected dry eye and normal group. Statistical significance is denoted by *; p value analysed using Paired t-test.

DISCUSSION

- All artificial tears and control solution having pH within ocular comfort range^[6,7], except SH (pH: 7.85), while for viscosity, only SHUD (viscosity: 32.73cP) was found to have viscosity beyond the threshold suggested by the previous study^[3].
- Tolerable limit of artificial tears measured using ODCS was reported to be in the range of 0.3 to 2.05^[9-11]. Following instillation, artificial tears used in this study were well tolerated, except for SH (2.27) and OUD (2.07) in normal group, and SHUD in SDE group (2.07).
- In general, all artificial tears significantly improved at least one of the ocular symptoms listed, except for OUD in SDE group. Meanwhile, overall discomfort and dryness improved significantly after 60 minutes instillation of O in both groups.
- Even with the same active and inactive ingredients in O and OUD; it seemed that O was more effective in improving ocular symptoms compared to OUD. This finding was contradict with the previous study^[12] which demonstrated significant improvement in ocular symptoms (OSDI score) after switching from preserved to non-preservative artificial tears.
- The data presented indicates that viscosity of artificial tears was not an important factor in improving ocular symptoms. It could be seen that for SHUD and SH, even with higher viscosity compared to other artificial tears, they were less effective in relieving the ocular symptoms in normal and SDE groups.

CONCLUSION

Optive provides less subjective sensation and better ocular symptoms in both groups after 60 minutes instillation as compared to other artificial tears

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