Novel Hydroxypropyl-Guar Gellable Lubricant Eye Drops for Treatment of Dry Eye

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ABSTRACT

Objective: The objective of this review is to evaluate the safety and efficacy of polyethylene glycol 400/propylene glycol/hydroxypropyl-guar (Systane® Ultra [PEG/PG with HP-guar], Alcon Laboratories, Inc., Fort Worth, TX, USA) lubricant eye drops in reducing the signs and symptoms of dry-eye disease. Methods: A systematic literature search utilizing MEDLINE was conducted to identify peer-reviewed articles related to dry-eye disease and PEG/PG with HP-guar lubricant eye drops. The search covered the period prior to October 2009. Additionally, a manual search based on citations in the published literature was conducted. Results: The PEG/PG with HP-guar artificial tears shows in-vitro viscoelastic properties with pH optimization. The pH of the solution adjusts to the pH of the ocular surface upon instillation, which results in tear film elasticity and viscosity similar to that of subjects without dry-eye disease. The reviewed literature demonstrated that this delivery system showed a reduction in corneal and conjunctival staining in dry-eye disease, an improvement in tear film stability, a low coefficient of friction in an in-vitro model, and improved maintenance of best-corrected visual acuity over time. Conclusion: A few small-sized studies with short-term follow-up demonstrated that PEG/PG with HP-guar is a safe and effective lubricant eye drops for the treatment of dry-eye disease. Larger studies with longer duration are warranted to assess the long-term safety and efficacy of this formulation in patients with dry-eye disease.

Keywords: dry-eye disease; eye drops; HP-guar; Systane; tear film

INTRODUCTION

A systematic literature search utilizing MEDLINE was conducted to identify peer-reviewed articles related to dry-eye disease and polyethylene glycol 400/propylene glycol/hydroxypropyl-guar (Systane® Ultra [PEG/PG with HP-guar], Alcon Laboratories, Inc.,
Fort Worth, TX, USA) lubricant eye drops. The search covered the period prior to October 2009. Additionally, a manual search based on citations in the published literature was conducted. The search produced 51 articles, which are cited in this review.

DRY-EYE DISEASE

Definition

Dry-eye disease (keratoconjunctivitis sicca) is a prevalent condition of varying etiologies that affects millions of patients of all ages throughout the world. In 2007, the International Dry Eye Workshop's (DEW) Subcommittee for Definition and Classification presented a revised definition of dry-eye disease, stating, “Dry eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface.”1 It is important to note that in spite of advancement in medicine, science, and technology, scientific and medical communities still lack a full understanding of dry-eye disease, and that the understanding of dry-eye disease is still evolving.

Prevalence and Etiology

Current estimates of the prevalence of dry eye range from 5% to 35%.2-5 These estimates indicate that in the US, approximately 40 to 60 million people suffer from dry-eye disease.6 Dry-eye disease is more prevalent in postmenopausal women, patients with autoimmune diseases, and the elderly, than in the general population.3,7,8 Social habits, such as smoking, can exacerbate dry-eye disease.9 Activities associated with visual tasks, such as prolonged reading and the use of video display terminals (eg, television and computer screens), also provoke symptoms of dry eye.10

Diagnosis, Signs, and Symptoms

Diagnosing, staging, and determining efficacy of therapy in dry-eye disease is often challenging due to correlation between signs and symptoms. Unlike many conditions where associated signs and symptoms are linked, patients with dry-eye disease may or may not exhibit signs or symptoms of dry eye.11

Subjective assessment of dry-eye disease can be achieved using symptom questionnaires, which are well-validated tools for detecting and staging ocular dry-eye disease, especially when used in conjunction with clinical testing. Despite the advantages of symptom questionnaires, many healthcare providers do not include the questionnaires into their routine work-ups.13

In 2007, the International DEW recommended that healthcare providers adhere to a specific sequence in clinical testing when objectively assessing patients for ocular surface disease:14 1) measurement of the tear film break-up time (TFBUT) with fluorescein; 2) vital staining with lissamine green or rose Bengal; 3) evaluation of the production of tears with Schirmer's test; 4) assessment of the morphology of the eyelids and meibomian glands; and 5) testing the function of the meibomian glands. Each of these tests provides specific information regarding dry-eye disease. Many emerging technologies, such as confocal microscopy, optical coherence tomography, and osmolarity measuring systems, among others show promise for improving the diagnosis and measuring the effect of treatment of dry-eye disease.