Contact Lens and Anterior Eye xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Contact Lens and Anterior Eye

journal homepage: www.elsevier.com/locate/clae

Editorial

The scientific dry eye disease journey: From the beginning to the end of the beginning

In Alice's Adventures in Wonderland the White Rabbit asks "Where shall I begin…?" "Begin at the beginning," the King said…" and go on till you come to the end…" [1] My beginning to understand dry eye disease (DED) began in 1982 (Fig. 1), when I was recruited into the eye field. My first step was to learn what was known about DED. In the early 1980's the pathophysiology of dry eye DED, then called keratoconjunctivitis sicca (KCS), was attributed primarily to aqueous tear deficiency [2,3]. Indeed, it was thought that Sjögren syndrome represented "the greatest single cause of KCS worldwide, excluding those countries wherein trachoma remains epidemic [4]." Additional etiologies for KCS were believed to be estrogen deficiency at/after menopause, lacrimal duct obstruction, mucin insufficiency (e.g. loss of goblet cells), diminished eyelid function, and chronic blepharitis [2,3]. Lipid deficiency was not considered a factor, because there was "no known specific deficiency of tear film lipid [3]."

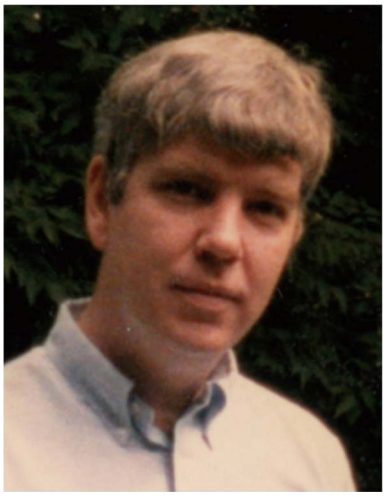

Fig. 1. David A Sullivan @ 1982.

During the early 1980's the proposed treatments for dry eye disease were artificial tears, punctal occlusion, and systemic estrogens. Anti-inflammatory medications were not recommended, because there were "no obvious acute inflammatory changes in the lacrimal glands in most dry eye cases," and use of these agents was "not associated with a dramatic increase in tear production [3]."

Fast forward ten years to 1992, and my next big step. I organized an international conference to assess critically the current knowledge and 'state of the art' research on the structure and function of tear-film producing tissues, tears and the ocular surface in both health and disease. This meeting, entitled the 1st International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes (Southampton, Bermuda, November 1992), sought to promote an international exchange of information that would be of value to basic scientists, eye care practitioners and pharmaceutical companies with an interest in the treatment of lacrimal gland, tear film and ocular surface disorders. It also created a 729-page Proceedings book, which provided an educational foundation and scientific reference for research on the tear film, ocular surface and DED (Fig. 2) [5]. Michael Lemp, MD gave a keynote address on clinical trials and dry eye disease. In reviewing the topic for his presentation, he was appalled at the lack of information on this subject and stated "…I propose an academic-clinical practice-industry-governmental effort to develop a consensus" for designing clinical trials for the evaluation of treatments for dry eye syndrome. [6] This led to his organization of the National Eye Institute (NEI)/Industry Workshop on Clinical Trials in Dry Eyes (Fig. 3) [7]. The NEI/Industry Workshop was the first formal attempt to define and classify DED. The 1992 Bermuda Conference and subsequent conferences in Bermuda (1996) [8] and Maui (2000) [9] led to the launch of the Tear Film and Ocular Surface

https://doi.org/10.1016/j.clae.2017.11.001

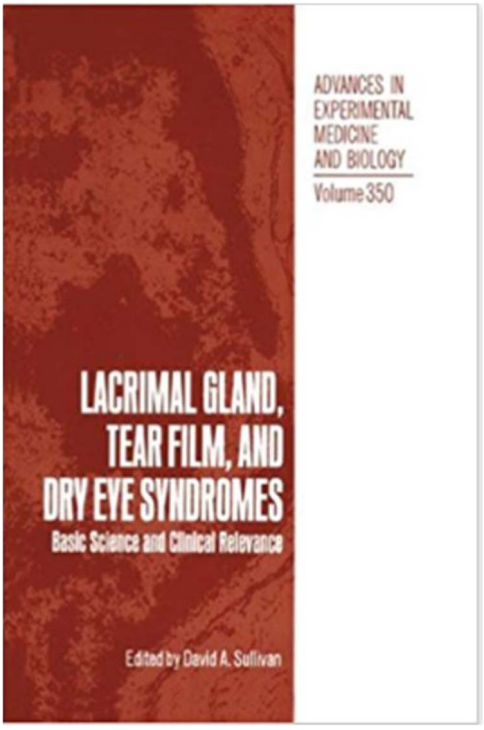

Fig. 2. Bermuda 1992 Proceedings book.

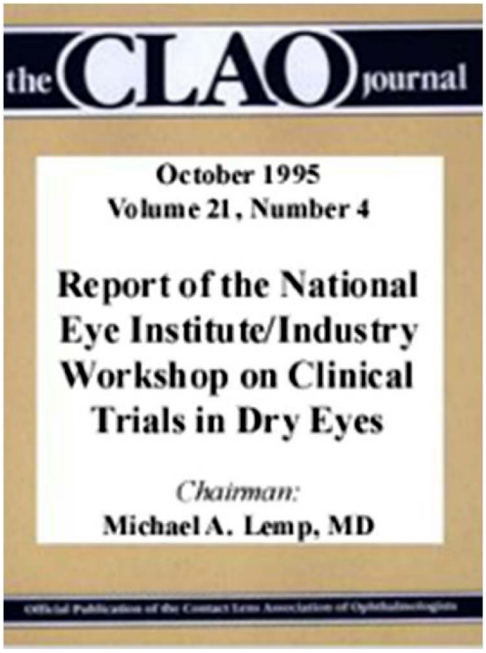

Fig. 3. NEI/Industry Workshop report.

Society (TFOS) which I co-founded in 2000 (www.tearfilm.org). The TFOS mission, in many ways analogous to that of the Bermuda/Maui Conferences, was and is to advance the research, literacy and educational aspects of the scientific field of the tear film and ocular surface.

Another step in my journey occurred in 2002. Kazuo Tsubota, MD proposed to Amy Gallant Sullivan (Fig. 4) and me to bring specialists from around the world to create a consensus definition of, and a diagnostic approach for, DED. This idea led to my organization with Kazuo, Michael Lemp and Anthony Bron of the TFOS Dry Eye WorkShop (DEWS). This initiative was designed to provide an evidence-based critical review of the definition, classification, epidemiology, diagnosis, management, and research techniques of DED. The TFOS DEWS™ report was published in 2007 (Fig. 5) [10], and its impact was amazing. As noted by Gary Foulks, MD, "The publication of the (TFOS) DEWS Report…was a landmark event in the history of our understanding and treatment of dry eye disease." Further, according to an industry representative, the TFOS DEWS™ report was called the DED "Bible" by a European Medicines Agency official and recommended for those European pharmaceutical companies seeking guidance on how best to conduct a clinical trial for DED.

Another step in my journey to understand DED took place in 2008. I organized the TFOS Workshop on Meibomian Gland Dysfunction (MGD). At