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Literature List

Meibometer®

C.K.S. Chew, J.M. Tiffany, S. Dikstein, A.J. Bron, Lipid levels on the lid margins of patients with meibomian gland dysfunction, Invest. Ophthalmol. Vis. Sci. 1992; 33:950

Diseases of the Meibomian glands are poorly understood at present. Although originally thought to be caused by bacterial infection, they are now widely accepted to be of non-infectious aetiology. The term Meibomian gland dysfunction (MGD) is used to include all disorders of the Meibomian gland. Although disorders of the Meibomian glands are very common there is as yet no widely accepted way of classifying them.

C. Franck, E. Bach, P. Skov, Prevalence of objective eye manifestations in people working office buildings with different prevalence of the sick building syndrome compared with general population, Int. Arch. Occup. Environ. Health. 1993; 65: p. 65-69

Summary A: cross-sectional clinical epidemiological study was carried out among 169 office workers in four Copenhagen town halls with different prevalences of the sick building syndrome. The results were compared with those in 112 subjects randomly selected from the general population. Biomicroscopic eye manifestations, such as premature break-up of the precorneal tear film, absence of foam at the inner eye canthus and epithelial damage of the bulbar conjunctiva, were investigated together with self-reported eye complaints. Although intercorrelated, the objective eye manifestations independently were statistically associated with self-reported eye complaints in office workers. The prevalence of the objective eye manifestations was significantly elevated in office workers compared with the general population and most pronounced for the buildings with a high prevalence of the sick building syndrome ($P < 0.001$). In the general population, subjects with a non-industrial occupation, including office workers, had a significantly higher prevalence of objective eye manifestations than those with an industrial occupation ($P = 0.03$), but the prevalence was still significantly lower than that among the office workers in buildings with a high prevalence of the sick building syndrome ($P < 0.001$). Since possible confounders were found not to explain the difference in prevalence of objective eye manifestations and complaints among the two populations, it is concluded that the office environment (buildings and/or type of office work) promotes these objective changes accompanied by self-reported complaints.

C.K.S. Chew, P.G. Hykin, C. Jansweijer, S. Dikstein, J.M. Tiffany, A.J. Bron, The casual level of meibomian lipids in humans, Current Eye Research, Vol. 12, No. 3, 1993

Using a modified skin surface lipid measuring instrument, the Meibometer, the amounts of meibomian lipid on the lid margins (the casual levels) of 421 subjects aged 1 to 94 years were measured. The lowest levels were found in children younger than 14 years (means \pm S.E.: males = 1.48 ± 0.17 , females 1.53 ± 0.17 $\mu\text{g lipid/mm}^2$ lid margin surface) and rose with age, the highest levels being found in males aged 60-69 years (means \pm S.E. = 3.26 ± 0.18 $\mu\text{g lipid/mm}^2$ lid margin surface).

*C.K. Chew , C. Jansweijer, J.M. Tiffany , S. Dikstein, A.J. Bron, **An instrument for quantifying meibomian lipid on the lid margin: the Meibometer***, Curr. Eye Res. 1993 Mar;12(3): p. 247-54

Abstract: An instrument, the Meibometer, is described for estimating the casual level of meibomian lipid on the human eyelid margins, adapted from a commercially-available instrument used for measurement of skin surface lipid. A loop of plastic tape is pressed onto the everted lower lid margin to lift off a blot of lipid. The resultant change in light transmission of the tape is read by a photometer. Readings are not affected by side (R or L), time of day or lid surface temperature. After cleaning lipid from the lid margins with hexane, the rate of recovery per 10 blinks, as a percentage of the pre-cleaned level, was measured as 33.7 +/- 5.8 (mean +/- SE). This rate of delivery appears to provide enough lipid for complete resurfacing of the precorneal tear film with every blink. Over short periods no detectable lipid was delivered in the absence of blinking.

*J.M. Tiffany, A.J. Bron, F. Mossa, S. Dikstein, **Delivery of meibomian oil using the clinical Meibometer®***, Lacrimal Gland, Tear Film, and Dry Eye Syndromes 2, Plenum Press, New York, 1998

Tear film studies in recent years have emphasized the importance of the oily secretion of the meibomian glands in reducing evaporation from the open eye and in promoting stability of the precorneal film. The thickness of the spread oil film is readily measured, but little information exists on the amount of oil available for the film, or on its quantity or manner of delivery from the glands.

*N. Yokoi, F. Mossa, J. Tiffany, A.J. Bron, **Assessment of Meibomian Gland Function in Dry Eye Using Meibometry***, Arch. Ophthalmol., Vol. 117, June 1999, www.archophthalmol.com

Forty-two patients with clinically diagnosed dry eye that was reclassified as meibomian gland dysfunction (MGD (n=12)), aqueous-tear deficiency (AD (n=10)), MGD combined with AD (n=2), "incomplete" dry eye (n=12), and non-dry eye (6 eyes) were compared with 41 healthy control subjects. The following 2 techniques of meibometry were applied: direct meibometry (DM) measuring lipid imprints using the Meibometer, and integrated meibometry (IM) using image-scanning and computer densitometry.

*N. Yokoi, F. Mossa, J. M. Tiffany, A. J. Bron, **Assessment of Meibomian Gland function in Dry Using Meibometry***, Arch. Ophthalmol., 117; June 1999

Meibomian gland disease is a common condition that is often symptomatic. Meibomian gland dysfunction (MGD) is a term adopted by Jester et al chiefly to describe obstructive meibomian gland disease. The primary disease is common, but there is a strong association between MGD and certain forms of skin disease such as a topic and seborrheic dermatitis and acne rosacea. It also may be caused by systemic retinoid therapy or less commonly by polychlorinated biphenyl. Obstructive MGD may be focal, with patchy involvement of gland, or diffuse, when oil expression is impaired in all glands. Cicatricial and non-cicatricial forms of MGD exist.

*R. Ofri, K. Orgad, P.H. Kass, S. Dikstein, **Canine meibometry: Establishing baseline values for meibomian gland secretions in dogs***, The Veterinary Journal (2006)

Meibomian lipid secretions are essential in preventing tear evaporation. Disorders of the meibomian glands may therefore play an important role in the pathogenesis of some forms of keratoconjunctivitis sicca (KCS). Until now, meibomian lipid secretions have never been quantitatively evaluated in dogs.

*P. Benz , A. Tichy , B. Nell, **Review of the measuring precision of the new Meibometer MB 550 through repeated measurements in dogs***, Vet Ophthalmol. 2008 Nov-Dec;11(6): p. 368-74

A meibometer is a device to measure the delivery rate of lipids on the eyelid margin. The aim of this study is to determine the measuring precision of the new Meibometer MB550 (Courage-Khazaka electronic GmbH, 50829, Cologne, Germany), linked to a computer, by means of repeated measurements in dogs by different examiners. PROCEDURE: Two investigators measured the lipid rate on the eyelid margin in 10 healthy dogs for 10 days. One examiner measured the right eye (OD) and the other measured the left eye (OS) for 5 days. After 5 days, the eyes to be measured were

switched between the examiners. The new device was able to record all measurement values as charts and curves in comparison to the previous Meibometer, which displayed only one value.

*A. Wenzel, J.K. Mueller, C. Eule, **Meibometry: a reliable tool for feline ophthalmology?**, International Veterinary Ophthalmology Meeting 14. - 18. May 2008, Versailles France*

Purpose: Meibomian lipid secretions are forming the outermost tear film layer and are essential in preventing tear overflow and evaporation. In human and canine ophthalmology meibometry is described as a simple, minimally invasive method to quantify the amount of lipid at the lid margin and to detect meibomian gland (dys)function. The aim of this project, performed during a student's elective course, was to evaluate feasibility of meibometry in healthy cats.

*P. Versura, V. Profazio, M. Ortolani, C. Coslovi, A. Bron, E.C. Campos, **Performance of Meibometry Analysis in Meibomian Gland Dysfunction (MGD) Evaluation**, tfof Florence 2010, Poster 36*

Meibometry is a non-invasive method to assess meibomian lipid reservoir. We aimed to evaluate the diagnostic performance of lipid casual distribution at the central lower lid margin, as measured by Meibometry, in classifying and quantifying MGD. 96 patients: 62 women, 43 men, medium age, 49,5 and 52,7 yrs. Respectively. Direct Meibometry (DM) was performed by Meibometer MB550 (Courage-Khazaka electronic GmbH, Germany) readings in AU (Arbitrary Units).

*M. Streker, L. Kleine-Börger, M. Kerscher, **Efficacy of a novel formulation for eyelashes revitalization – results of a pilot study**, University of Hamburg*

Background: Long lashes are associated with attractiveness. Lash growth has been reported following an accumulation of prostaglandin after application of eye drops. The aim of this single-center, randomized trial was to determine the revitalizing effect of a new lash serum by using a clinical score, a patients' satisfaction questionnaire and biophysical measurements over a study period of 12 weeks (figure 1). Material and methods: 30 adult healthy volunteers (26 women, 4 men) wishing longer and fuller lashes were enrolled. Study specific exclusion criteria were lash extensions and colored lashes. Primary endpoint was to evaluate the effects of the lashes serum by using a five-point rating scale (figure 2). Both patients and blinded evaluator were asked to rate the effect according to standardized clinical photographs (Fotofinder Systems, Teachscreen Software GmbH, Bad Birnbach, Germany). To evaluate skin tolerance, pH-value, corneometry and lacrimal fluid's lipid content were measured (all Courage+Khazaka, Cologne, Germany).

Klinische Studie bezüglich der Wirksamkeit und Verträglichkeit (Auszug), Institut Dermatologie an der Universität Hamburg (2013), Ästhetische Dermatologie 8, 2015

Fragestellungen: Eruiert werden sollten der Vitalisierungseffekt für die Wimpern, die Patientenzufriedenheit sowie biophysikalische Messergebnisse. Untersuchungskriterien und Methoden: Ausschlusskriterien waren gefärbte Wimpern und künstliche Wimpernverlängerungen. Entsprechend einer 5-Punkte-Skala wurden die Effekte untersucht. Die Bewertung geschah sowohl durch die Probanden als auch durch neutral externe Auswertung basierend auf standardisierten klinischen Photographien (Fotofinder Systems/Deutschland). Zusätzlich wurde die Patientenzufriedenheit ausgewertet. Zur Bestimmung der Hauttoleranz wurden eingesetzt: pH-Wert-Messung, Corneometrie und die Messung des Lipidgehaltes in der Tränenflüssigkeit (alles durchgeführt mit Geräten von Courage & Khazaka, Köln).

*N. Nakavama, M. Kawashima, M. Kaido, R. Arita, K. Tsubota, **Analysis of Meibum Before and After Intraductal Meibomian Gland Probing in Eyes With Obstructive Meibomian Gland Dysfunction**, Cornea, 2015 Oct;34(10): p. 1206-8*

Purpose: To evaluate whether the amount of meibum and its viscosity change after intraductal Meibomian gland probing in patients with refractory obstructive meibomian gland dysfunction (o-MGD). Method: Six lid margins of 3 patients with refractory o-MGD underwent intraductal meibomian gland probing. Meibum and the clinical outcome were evaluated before the procedure and at a 1-month postoperative visit. Meibum was quantified with a Meibometer, and its viscosity (Shimazaki

grade) was assessed simultaneously. The tear film condition was evaluated by lipid layer interferometry (DR1, Kowa, Nagoya, Japan), and meibomian gland loss was analyzed by noncontact infrared meibography. Lid margin findings, tear break-up time, fluorescein score, and ocular symptoms were also assessed. Results: At the postoperative visits, all cases showed improvements in meibum lipid levels (446-1376, 757- 802, and 396-571 meibometer units) and meibum viscosity (grade 3-0, 3-1, and 3-2). Two cases showed an improvement in tear break-up time (2-5 and 0-6 seconds). No morphological changes in the meibomian gland were observed in any cases. Conclusions: Intraductal meibomian gland probing seems to improve meibomian gland lipid levels, and it may be a good treatment option for cases of o-MGD that are resistant to conventional treatment.