TEAR FILM DYNAMICS FROM OCULAR SURFACE IMAGING IN DRY EYE AND CONTACT LENS WEAR

BY

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ABSTRACT

The difficulty associated with the current techniques drove the investigations presented in the present thesis which aimed at investigating the clinical usefulness of corneal topography and slit lamp videography in the assessment of tear film dynamics in dry eye and contact lens wear.Six-hundred and forty-two (642) eyes of 321 subjects took part in *Study 1* where several parameters were derived from corneal topography and slit lamp videography, and the assessment of meibomian gland dysfunction (MGD) and Schirmer test with anaesthesia (STA) made. Tear film break-up time (TFBUT) was significantly correlated with STA (tear production test), MGD (tear production and tear elimination tests), and lipid floating time (LFT) ($p < 0.05$). Corneal irregularity measurement (CIM) after 5 seconds of holding the blink (CIM 5) had significant correlation with LFT while CIM after 8 seconds of blink holding (CIM 8) was significantly correlated with MGD. Furthermore TFBUT, LFT, and tear meniscus height (TMH) were significantly reduced in the dry eye group compared to non-dry eye group. In *Study 2* parameters from slit lamp videography (as derived in Study 1), plus pre-lens tear film (PLTF) non-invasive tear break-up time (obtained from corneal topography) were followed-up in the investigation of the effects of 8 hours of contact lens wear comparing that of each subject's own habitual hydrogel contact lens to newly-prescribed daily silicone hydrogel contact lens. Thirty six (36) eyes of 18 habitually wearing hydrogel contact lenses (mean age =22.9 ± 3.7 years old) were involved, and it was found that PLTF, TFBUT, and LFT were all significantly reduced ($p < 0.05$) after wearing each lens type for 8 hours. The tear film changes noted for each lens type after the 8 hours of wear were however, not significantly different ($p > 0.05$) between habitual hydrogel and the silicone hydrogel contact lenses. In *Study 3* the tear ferning patterns (indirect tear production test) were compared among non-contact lens wearing, soft contact lens wearing, and post-contact lens related microbial keratitis (Post-CLRMK) subjects. Abnormalities in the tear ferning pattern of the habitual contact lens wearing subjects and post-CLRMK subjects were statistically similar ($p > 0.05$). In conclusion corneal topography and slit lamp videography have been shown from the studies presented in this thesis to be useful clinical tests representing the phases of tear production, distribution and elimination, for the assessment of tear film dynamics in the clinical setting.

ملخص البحث

قادت الصعوبة المرتبطة بالتقنيات الحالية الباحثين في الأطروحة الحالية التي تهدف إلى بحث الفائدة السريرية من تضاريس القرنية وشق مصباح بالفيديو في تقييم ديناميات فيلم المسيل للدموع في العين الجافة وارتداء العدسات اللاصقة. أخذت ست مئة واثنين وأربعين (642) عين من 321 مشارك في الدراسة 1 وتم اشتقاق العديد من القياسات من تضاريس القرنية وشق مصباح بالفيديو وتقييم خلل الغدة الميوبية واختبار شارمر مع التخدير. ارتبط اختبار وقت تفكك فيلم المسيل للدموع بشكل ملحوظ مع اختبار انتاج الدموع واختبار ازالة الدموع)، ووقت الدهون العائمة (P<0.05). ارتبط قياس عدم انتظام القرنية بعد 5 ثوان من مسك الرمش مع وقت الدهون العائمة بينما ارتبط عدم انتظام القرنية بعد 8 ثوان من مسك الرمش. في دراسة 2 قياسات المصباح الشقي بالفيديو (في الدراسه 1)، تم الحصول على زيادة قبل عدسة فيلم المسيل للدموع ووقت تكسر الغير الغازية من تضاريس القرنية تم متابعتها في التحقيق من تأثير ارتداء العدسات اللاصقة 8 ساعات مقارنة مع عدسة هيدروجيل الاصقه المعتادة لكل شخص لوصفه يومية حديثة من عدسة سيليكون هيدروجيل اللاصقة. لبست ستة وثلاثين (36) عين من 18شخص عدسات هيدروجيل اللاصقة (متوسط العمر = 22.9 ± 3.7 سنة)، وتبين انخفاض اختبار PLTF، وTFBUT، وLFT (P <0.05) بعد ارتداء كل عدسة لمدة 8 ساعات. لوحظ تغيير في فيلم المسيل للدموع لكل نوع عدسة بعد 8 ساعات من الارتداء ولكن، لا يوجد اختلاف (P> 0.05) بين عدسة هيدروجيل المعتادة، والعدسات سيليكون هيدروجيل اللاصقة. في دراسة 3 تم مقارنة أنماط تسرسخ المسيل للدموع (اختبار الإنتاج المسيل للدموع الغير مباشر) بين ارتداء عدسة غير لاصقة ، ارتداء عدسه لاصقة لينة، وارتداء عدسة عند الاشخاص بعد وجود قرنية جرثومية. كانت تشوهات تسرسخ نمط المسيل للدموع مشابهه احصائيا بين الاشخاص اللذين يرتدون العدسات اللاصقة المعتادة اللذين يرتدون العدسة بعد وجود قرنية جرثومية (P< 0.05). ختاما تبين من الدراسات التي قدمت في الأطروحة أن تضاريس القرنية والمصباح الشقي بالفيديو قد تكون اختبارات سريرية مفيدة تمثل مراحل إنتاج و توزيع وازالة المسيل للدموع ، لتقييم ديناميات فيلم المسيل للدموع في الإعدادات السريرية.

APPROVAL PAGE

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DECLARATION

I hereby declare that this thesis is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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LIST OF SYMBOLS

Symbols	Definition	Symbols	Definition
±	plus or minus	F	distribution function
<	Less than	α	alpha
>	More than	Δ	precision
≥	greater than or equal to	χ^2	chi-square
≤	less than or equal to	t	Student's t variable
/	divided by	β	Beta
X	multiplied by or times	:	Colon
=	Equals sign	;	Semi-colon
( )	Bracket	,	Coma
P	proportion in population	Z	Standard normal variable
p	level of significance	©	Copywrite
%	percent	" "	Citation mark
%/min	percent per minute	' '	Quotation mark
N	Number	?	Question mark
g	Gram	I	One
cm	centimetre	II	Two
g cm-2 sec-1	gram per centimetre square per second	III	Three
™	trade mark	IV	Four
°	degree	V	Five
[ ]	Bracket	VII	Seven

Symbols	Definition	Symbols	Definition
&	and	µm	micrometre
D	Dioptre	mOsmol	milliosmol
ºF	Farenheit degree	10^{-7}	ten to the power of minus seven
mm^2	millimetre square	10^7	ten to the power seven
mm sec-1	millimetre per second	mOsM	milliosmol
mm/ s	millimetre per second	mOsM/kg	milliosmol per kliogram
ml/min	millilitre per minute	÷	divided by
nm	nanometre	®	Registered trademark
+	plus	^{2}	square
-	minus	30-sec	30 seconds
ºC	degree celcius	r	Correlation coefficient
µ	micron	R^2	coefficient of determination