



ORIGINAL ARTICLE

The Relationship Between Tear Ferning Patterns and Non-invasive Tear Break-up Time in Normal Asian Population



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Received 5 February 2015; accepted 27 September 2015

Available online 1 December 2015

KEYWORDS

Tear ferning patterns;
Non-invasive tear
break-up time;
Pre-ocular tear film

Abstract

Purpose: To investigate the relationship between tear ferning patterns (TFP) and non-invasive tear break-up time (NIBUT) in normal Asian subjects.

Methods: One hundred and forty-five adults with no ocular surface disorders were recruited. TFP and NIBUT were determined. Tears were collected using a capillary tube and allowed to air dry at room temperature for 10 min. TFP was later observed using a light microscope and classified according to Rolando's classification. Measurement for NIBUT was obtained using a Tearscope with the slit lamp magnification.

Results: It was found that there is no significant difference between gender in TFP ($Z=-1.77$, $P>.05$) and NIBUT ($Z=-1.475$, $P>.05$). There is also no significant difference between Malay, Chinese, Indian, and other races in TFP, ($H(3)=4.85$, $P>.05$) and NIBUT ($H(3)=2.18$, $P>.05$). However, there is a significant difference between age groups of 20–29, 30–39, 40–49, and 50–60 years old in both TFP ($H(3)=28.25$, $P<.01$) and NIBUT ($H(3)=36.50$, $P<.001$). Spearman's correlation showed there was a significant relationship between TFP and NIBUT ($r=-0.55$, $P<.001$), age and NIBUT ($r=-0.50$, $P<.001$), age and TFP ($r=0.41$, $P<.001$), McMonnies score and NIBUT ($r=-0.40$, $P<.001$), McMonnies score and TFP ($r=0.31$, $P<.001$), as well as age and McMonnies score ($r=0.52$, $P<.001$).

Conclusion: TFP and NIBUT was age dependent but not gender and race dependent. Older subjects had higher grade of TFP and McMonnies questionnaire score but lower NIBUT value. TFP and NIBUT can be used to assess the tear film quality.

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PALABRAS CLAVE

Patrones del Test de Ferning;
TBUT no invasivo;
Película lagrimal pre-ocular

Relación entre los patrones del Test de Ferning lagrimal y el TBUT no invasivo en la población normal de Asia

Resumen

Objetivo: Investigar la relación entre los patrones del test de Ferning (TFP) y el test de rotura lagrimal no invasivo (NIBUT) en sujetos asiáticos normales.

Métodos: Se incluyó a ciento cuarenta y cinco adultos, sin trastornos en la superficie ocular. Se calcularon el TFP y el NIBUT. Se recolectaron lágrimas utilizando un tubo capilar, dejándose secar a temperatura ambiente durante diez minutos. Se observó posteriormente el TFP utilizando un microscopio óptico, clasificándose el patrón mediante los criterios de Rolando. La medición del NIBUT se obtuvo utilizando el Tearscope, con imagen ampliada en el biomicroscopio.

Resultados: Se comprobó que no existen diferencias por sexo en relación a TFP ($Z = -1,77$, $p > 0,05$) y NIBUT ($Z = -1,475$, $p > 0,05$). Tampoco existen diferencias significativas entre las razas Malaya, China, India y demás en relación a TFP, ($H(3) = 4,85$, $p > 0,05$) y NIBUT ($H(3) = 2,18$, $p > 0,05$). Sin embargo, existe una diferencia considerable entre los grupos de edad de 20-29, 30-39, 40-49 y 50-60 años tanto en relación a TFP ($H(3) = 28,25$, $p < 0,01$) como a NIBUT ($H(3) = 36,50$, $p < 0,001$). La correlación de Spearman reflejó una relación significativa entre TFP y NIBUT ($r = -0,55$, $p < 0,001$), la edad y NIBUT ($r = -0,50$, $p < 0,001$), la edad y TFP ($r = 0,41$, $p < 0,001$), la puntuación de McMonnies y NIBUT ($r = -0,40$, $p < 0,001$), la puntuación de McMonnies y TFP ($r = 0,31$, $p < 0,001$), y la edad y la puntuación de McMonnies ($r = 0,52$, $p < 0,001$).

Conclusión: TFP y NIBUT dependen de la edad, pero no del sexo ni la raza. Los sujetos de mayor edad reflejaron un grado superior de TFP y de puntuación del cuestionario de McMonnies, pero un valor inferior de NIBUT. TFP y NIBUT pueden utilizarse para evaluar la calidad de la película lagrimal.

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Introduction

The pre-ocular tear film (POTF) plays an important role in preserving and optimizing the visual quality and maintaining the health of the ocular surface. Most studies have focused on the relationship between the tear film stability, tear composition, tear quality, and different types of test for tear evaluation.

Tabbara and Okumoto¹ as well as Rolando² proposed the use of tear ferning patterns to evaluate tear quality. Tear fluid, when dried on a microscope slide, produces a specific ferning pattern, which is due to an interaction between various electrolytes in the tears and macromolecules such as proteins.³ An increased salt concentration in tears and other changes in tear composition may cause an alteration in the ferning patterns observed.⁴

Rolando² identified dissimilarity among tear ferning patterns and presented a classification system, which has become a useful diagnostic tool in tear ferning studies. It has been classified into four qualitative categories, which are based on the size, the appearance and density of the ferns observed. Rolando noted that normal tear film often showed a type I pattern (with lots of ferns and tightly packed together) or type II pattern (abundant ferning but with spaces in between them), whereas type III (reveals scarce or single ferns) and type IV (absence of ferns) demonstrated poor tear ferning patterns.

The introduction of NIBUT test allows us to examine tear stability without involving a foreign substance into the

tear film. It helps to overcome the limitations in fluorescein break-up time where touching of the fluorescein strip to the conjunctiva can stimulate reflex tearing. Although there are certain fluorescein strips designed specifically for fluorescein break-up time (FBUT) test and are claimed to deliver only minimum amount of fluorescein without stimulating reflex tearing, yet the presence of fluorescein in the tears possibly also changes the tear film properties and tear stability. NIBUT measurements are longer than fluorescein breakup time⁵ and it is believed to be more patient-friendly, repeatable, and precise.⁶

NIBUT test reflects tear stability and quality. It is a commonly used test in the diagnosis of dry eye. Conversely, tear ferning is relatively uncommon test but is has been a useful and comparable test to diagnose dry eye. Studies conducted by Rolando² and Kogbe et al.⁷ found that more than 80% of normal eyes showed type I and type II patterns and in keratoconjunctivitis sicca patients, more than 90% had type III and type IV ferning patterns.

More recently, tear ferning patterns have been investigated in association with overnight variation,⁸ postmenopausal women,⁹ newborn babies,¹⁰ after pterygium excision¹¹ and in contact lens wearers.¹² These studies had shown that ferning patterns were worse upon waking, dry eye sufferers amongst post-menopausal women demonstrated worse ferning patterns, newborns secrete moderate quantity and good quality tears, post-surgical improvement of fern pattern and higher grades of tear ferning patterns were observed in CL wearers. All these studies proved that

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