

DEWS	DRY EYE: DIAGNOSTIC TEST TEMPLATE	
RAPPORTEUR	Maurizio Rolando	11 th Jan 2006
TEST	Tear ferning test (TFT)	REFERENCES
TO DIAGNOSE	Quality of tears (electrolyte concentration), KCS, Hyperosmolarity	
VERSION of TEST	[V1] Tear ferning test (tear collection by rod) [V2] Tear collection by glass capillary)	Rolando 1984; Norn 1994
DESCRIPTION	A drop of tear is collected from the lower meniscus and dropped onto a microscope slide and allowed to dry by evaporation. Different forms of crystallization patterns can be observed and classified.	Golding et al. 1994; Rolando 1986-1988; Pearce, Tomlinson 2000.
CONDUCT of TEST	1. The subject is seated, with the head resting comfortably, in a dim light. 2. With the eyes in upgaze, by means of a micropipette, nearly 1 microliter of tears is collected by capillarity from the lacrimal river of the lower meniscus. 3. The fluid is then dropped onto a microscope slide and exposed to evaporation at 20+/- 3 C° for 10 minutes 4. The sample is then observed under a microscope at x 100-400 enlargement (better visibility is achieved with phase contrast microscopy) 5. The patterns of crystallization (ferning) are classified in 4 classes: Type 1: uniform large arborization, Type 2: ferning abundant but of smaller size; Type 3: partially present incomplete ferning; Type 4: no ferning. Types 1 & 2 are reported to be normal and Types 3 & 4 reported to be abnormal	Rolando 1984-1986
Web video	Not available	
Materials:	<ul style="list-style-type: none"> • capillary glass • clean microscope slides [] • light microscope (Phase contrast useful but not necessary) 	
Standardization	Time of day [any] Temperature [20-28 °C] Humidity [high humidity slows down the time of appearance of the ferns] Air speed: [the effect of excessive air speed has not been studied but increasing the evaporation rate could affect the pattern of ferning]. Illumination: [the level of illumination seems irrelevant in the development of ferning patterns once the sample has been collected and dropped] Other: [Avoid excessive light and lid margin contact in order to decrease reflex tearing.]	
Variations of technique	In the original version, [V1] tear collection was achieved by capillary attraction by means of a 0.5 mm rod loop placed in contact with tears pooled in the lower fornix of the cul de sac The second version uses a capillary tube in contact with the fluid of the lowers meniscus. This increases reproducibility, with a coefficient of variation of 6.4%.	Norn 1994
Diagnostic value	This version : [] Other version: [2] prognostic value 86.6%	Albach et al. 1994
Repeatability	Intra-observer agreement. [Intraobserver agreement of 94.50% (kappa = 0.76; CI = 0.67-0.86). -] Inter-observer agreement. [Interobserver agreement 92.10% (kappa = 0.65; CI = 0.56-0.75)]	Pensyl and Dillehay 1998
Sensitivity	(true positives) [82.2%] [Cut off: Type III or worse according to the previously reported classification 6-7)	Albach et al. 1994
Specificity	(100 – false positives) [92.5%]	Albach et al. 1994

Other Stats	94% sensitivity 75% specificity [Cut off: Type III or worse according to the previously reported classification 6-7] 92% sensitivity 83% specificity [Cut off: Type III or worse according to the previously reported classification 6-7]	Norn 1994 Rolando 1986
Test problems	Care should be taken not to elicit reflex tearing during collections Light microscopy is often unavailable in the office. In spite of a good clinical ability of separating normal from dry eyes, the real meaning of the results is not known [Test affected by extreme conditions of temperature and humidity]	
Test solutions		
FORWARD LOOK	It would be interesting to explore the correlation between the patterns of crystallization (test types I to IV) and the level of tear film osmolarity	
Glossary	Tear Ferning: the branching pattern appearance of tear fluid once collected and dropped on a microscopy slide Tear Ferning Test: separation of normal from dry eyes on the basis of ferning patterns of tear crystallization.	

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