

Most clinicians diagnose and treat Dry Eye Syndrome based on the symptoms alone. Assessment of symptoms has been determined to be the single most important test for dry eye syndrome diagnosis, in fact these symptoms are regarded as *sine qua non* of dry eye syndrome (JAMA 2001;286:2114-9). We have adapted the McMonnies & Ho [Dry Eye Questionnaire](#) to provide you with a score based on your symptoms (score of more than 14.5 is consistent with dry eye diagnosis). Although it seems reasonable to diagnose dry eyes based on symptoms alone, it is useful to recall that 'symptoms of ocular discomfort' represent only one aspect of 'dry eyes' as [defined](#) by the National Eye Institute workshop on dry eyes. In the absence of a demonstrable tear deficiency or possibility of excessive tear evaporation and damage to the exposed surface of the eye, one cannot really satisfy the requirements of 'dry eye' diagnosis. However, in clinical practice, since 'symptoms of ocular discomfort' respond very well to dry eye treatment paradigm, it probably is fine to think of these symptoms to be due to dry eyes.

There are some basic tests that may be performed like tear film break-up time, Schirmer test and fluorescein staining. Most other tests are usually performed as part of dry eye research studies. Herein we will list all tests and the cutoff value at which they are considered abnormal and indicative of dry eyes, and will discuss in details the tests that are likely to be performed in a clinical setting.

Test

- Schirmer's I
- Tear Breakup time
- Tear Meniscus height
- [Fluorescein staining](#)
- [Rose Bengal staining](#)
- Tear film osmolarity
- [Impression cytology](#)
- Brush cytology
- Tear lactoferrin

Abnormal cutoff value for dry eye diagnosis

- less than or equal to 5 mm wetting over 5 minutes
- less than or equal to 10 seconds
- less than or equal to 0.2 mm
- more than 3 out of 15
- more than 3 out of 18
- less than or equal to 312 mOsm/L
- more than 1
- more than 1
- less than or equal to 0.9 ug/mL

● Schirmer's I Test

In Schirmer test, we measure the quantity of tears that are produced by the eye. If the tears are collected for some time, lets say 5 minutes or so, then one can determine whether the amount produced is sufficient for maintaining eye health or not. If not much tears are produced, then you have a [tear deficient dry eye](#). If you produce enough tears, but still have symptoms of ocular discomfort, then you may have [evaporative dry eye](#) for example due to blepharitis or Rosacea.

In [Schirmer test](#) a 35 mm x 5 mm size filter paper strip is used to measure the amount of tears that are produced over a period of 5 minutes. The strip is placed at the junction of the middle and lateral thirds of the lower eye lid. The test is done under ambient light. The patient is instructed to look forward and to blink normally during the course of the test. A negative test (more than 10 mm wetting of the filter paper in 5 minutes) means you produce normal quantity of tears. [Patients with dry eyes have wetting values of less than 5 mm in 5 minutes.](#)

An important limitation of Schirmer test is that there may be considerable variability in the results of tests done at different times and by different doctors. So whereas this is perhaps the most common dry eye test performed, its main utility may really be in diagnosing patients with severe dry eyes. Sequential tests to follow the course of a patient with mild dry eye may not be of value.

There is one point of some debate in Schirmer I test. When an anesthetic eyedrop is NOT used

then this test is thought to measure the basal + reflex tear secretion. When an anesthetic eyedrop IS used then this test is thought to measure only the basic tear secretion. There is compelling reason to believe that the tears measured by these two different methods may not sufficiently differentiate between basic and reflex tear production. Most clinicians perform this test after using anesthetic eyedrops to numb the eye. However, The National Eye Institute workshop on dry eyes recommended not to use anesthetic eyedrops before performing this test. The cutoff value is similar whether or not anesthetic is used. To measure the reflex tear secretion Schirmer II test may be performed. Schirmer II test is performed by irritating the nasal mucosa with a cotton-tipped applicator prior to measuring tear production.

Many clinicians regard the Schirmer test as unduly invasive and of little value for mild to moderate dry eyes. Other less invasive methods to assess the adequacy of tear production have been developed. The **Phenol red thread test** is one such test and is commercially available ([zone-quick](#)). A cotton thread impregnated with phenol red dye is used. Phenol red is pH sensitive and changes from yellow to red when wetted by tears. The crimped end of a 70mm long thread is placed in the lower conjunctival fornix. After 15 seconds, the length of the color change on the thread - indicating the length of the thread wetted by the tears - is measured in millimeters. Wetting lengths should normally be between 9mm and 20mm. *Patients with dry eyes have wetting values of less than 9 mm.*

● **Tear breakup time (BUT)**

Normal tear film is continuous. Blinking maintains the tear film continuity. If you keep your eyes open long enough, without blinking, the tear film will start breaking up. Your eye will feel uncomfortable forcing you to blink. In patients with dry eyes the tear film is unstable, and breaks up faster. Therefore the tear break up time in patients who have dry eyes is shorter. Said in another way, if your tear break up time is short then you may have dry eyes.

Fluorescein BreakUp Time (FBUT) is used most commonly. A strip of fluorescein is applied in the lower eyelid fornix and then removed. The patient is asked to blink three times and then look straight forward, without blinking. The tear film is observed under cobalt-blue filtered light of the slitlamp microscope and the time that elapsed between the last blink and appearance of the first break in the tear film is recorded with a stopwatch (a break is seen as a dark spot in a sea of blue). *Fluorescein BUT of less than 10 seconds or less is consistent with dry eyes.* Fluorescein BUT has important limitations. Touching of the filter paper strip to the conjunctiva can stimulate reflex tearing. Although special fluorescein strips designed specifically for FBUT are available and are claimed to deliver a fixed microvolume of fluorescein without stimulating reflex tearing ([Dry Eye Test](#)), still the mere presence of fluorescein in the tears perhaps also changes the tear film properties, so FBUT measurements may not be truly physiological.

To overcome these limitations, **Non Invasive Break up time (NIBUT)** methods have been developed. They are called Non Invasive because the eye is not touched. Instruments such as a keratometer, hand-held keratoscope or Tearscope are required to measure NIBUT. A prerule phase that precedes actual break up of the tear film can also be observed with some techniques. This prerule phase is termed Tear Thinning Time (TTT). Measurement is achieved by observing the distortion (TTT) and/or break up (NIBUT) of a keratometer mire (the reflected image of keratometer grid). The clinician focuses and views the crisp mires, and then records the time taken for the mire image to distort (TTT) and/or break up (NIBUT). NIBUT measurements are longer than fluorescein break up time. *NIBUT values of less than 15 seconds are consistent with dry eyes.* TTT / NIBUT are considered to be more patient-friendly, repeatable and precise.

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