There are many causes of dry eye. Some are:

- A knock on the head in the area of one of the tear-producing glands can lead to KCS.
- The most common cause of KCS appears to be immune-mediated destruction of the tear-producing gland tissue. We do not know what causes this type of inflammatory reaction but certain breeds are predisposed: the American Cocker Spaniel, the Miniature Schnauzer, and the West Highland white terrier.

How we make the KCS diagnosis

When KCS is in advanced state the situation is pretty obvious but early on in the case it may look like a simple case of conjunctivitis. In either case it is important to measure the tear production to determine how dry the eyes are. The test that accomplishes this is called the Schirmer Tear Test.

To perform the test, a strip of specific paper is put just inside the lower eyelid in the outer corner of the eye and left for 60 seconds. The moisture of the eye will wet the paper. At the end of the 60-second period, the length of the moistened area on the paper is measured. A length of 15mm or more is normal. A length 11 to 14mm is a borderline result. A height of less than 10mm is dry. A height less than 5mm is severely dry.

Treatment

Not that long ago, all we had to treat this condition was tear replacement formulas and mucus-dissolving agents. These are still helpful but require an impractical frequency of administration. A breakthrough came with the discovery of cyclosporine topical therapy to control the immune-mediated gland destruction.

Cyclosporine is an immunomodulating drug that had already been found helpful to organ transplant patients. When applied as an eye drop or ointment, it suppresses the immune destruction that is the most common cause of KCS, and tear production is restored. The success of this treatment plus its convenient dosing interval of once or twice a day has made this medication the primary treatment for KCS.

After beginning cyclosporine eye drops or ointment, a recheck in three weeks or so is a good idea to check for improvement. Unfortunately, it is relatively expensive as eye medication goes but after messing around with less effective treatments requiring more frequent administration for less predictable results, cyclosporine is probably worth it.
Occasionally patients simply do not show a good response to cyclosporine ointment but will respond when the concentration is increased. Higher concentration products can easily be formulated by compounding pharmacies.

**Tacrolimus** is another medication able to locally suppress immunity. This product has recently gained popularity in human medication as a topical anti-inflammatory treatment that is cortisone-free. It does not come in a formulation appropriate for eyes but can be made into one by a compounding pharmacy. It is used in a manner similar to cyclosporine and is generally of similar cost.

**Pilocarpine** is what is called a cholinergic drug, which means it works on the autonomic nervous system (the part that controls automatic functions such as gland secretion). Without going into too much neurologic detail, this medication can be given in the eye or orally to stimulate tear production. To use this medication orally, the eye drops are given at an increasing dose until side effects are seen (diarrhea, drooling, vomiting or drop in heart rate). At that point the dose is reduced and continued indefinitely, usually twice a day. Alternatively the drops can be given in the eyes. Recent studies have shown that pilocarpine does not increase tear production in normal dogs so there is some question over how well this method works.

**Artificial tears** can be purchased in most drug stores. These can be combined with other therapies and are certainly very soothing. The problem is that they are typically recommended for use 4 to 6 times a day.

**Antibiotic products** are often needed, especially when starting treatment for KCS because secondary infections are common when there are inadequate tears to wash infectious agents away. These products do not increase tear production but may be important, especially early in therapy.

**Mucomyst® Eye Drops** are made from a respiratory product used to dissolve thick mucus. In an eye formula, Mucomyst (active ingredient acetylcysteine) helps remove the thick eye discharge that accompanies dry eye.

**Surgical Solutions**

There is a surgical solution to KCS though it is a delicate procedure in general only done by veterinary ophthalmologists. This is called the parotid duct transposition. The parotid duct is the salivary gland on either side of the facial cheek. It produces saliva that is carried to the mouth via a long duct. This duct can be carefully dissected out and moved so as to deliver saliva over the eye. Saliva actually makes a reasonable substitute for tears though in time some mineral deposits will form on the eye surface and eye drops may be needed to control this. The dog’s eyes will water when he is fed and facial wetting may be objectionable.

The pigment on the surface of the cornea resulting from long-standing KCS is like the lens of dark sunglasses and interferes with a dog's vision, especially in dark situations. If tear function is restored, vision may also be restored through a procedure called a superficial keratectomy where the pigmented surface of the cornea is sanded away. This is obviously not worth doing if the tear issue is still problematic as in that case the pigment would just return. As with the parotid duct transposition, a veterinary ophthalmologist is probably best suited to perform such a procedure.