

**LEO MAGUIRE:** Hello, I'm Leo Maguire, one of the consultants here at Mayo Clinic, and the senior corneal expert at Mayo Clinic. This video we're showing today is the first in a series of videos that introduce a curriculum for corneal suturing that we use very successfully with our residents at Mayo for the last 15 years. We use a penetrating keratoplasty wet lab to make residents expert at corneal suturing around the corneal circumference. And when we say expert, we mean expert. After three four-hour sessions of wet lab instruction, we can document a level of expertise in our residents that is quantitatively close to flawless.

The first component of that curriculum is a text study of the steps involved in completely passing a corneal suture well. The residents review this information before coming to the wet lab so that they know the rationale for our technique. And this present video series will present the same information to you in video form. What we're trying to give you is the answer to the following question, how does one consistently place a perfect suture in a cornea wound?

This first figure shows the student the goal we wish them to achieve. The top figure shows the outcome from the surgeons view. And the bottom figure shows the suture in sagittal view. And the sagittal view actually gives the most information.

Now we can admire the suture aesthetically, but we really want to ask is, what is it about the engineering of the suture that makes it an excellent suture? First, we want the suture to be equally long on the graft and the host side of the wound. And we want that length to be consistent at each suture position around the circumference of the graft.

Second, we require the suture to be exactly radial on the host and the graft side of the wound. And third, we want the suture to be deep and parallel to the posterior surface of the graft and host, especially adjacent to the graft host interface. And we're looking for at least 80% depth on each side of the interface. Now all that attention to suture technique doesn't do any good if the surgeon then ties the suture either too loose or too tight. So we need a suture tension at the wound that gives good apposition without undue compression.

So how do we score this? The resident is awarded a point for accurate length on the graft, accurate length from the host, a point for radiality on the graft, for radiality on the host, a point for proper depth on the graft, a point for proper depth on the host, and a final point for good suture apposition with a suture tension that's not too loose to cause a leak, and not so tight

that it causes optical distortion.

So if this is our goal, how do we get there? The suturing task is really a four act play. In the first act, we want to position the forceps and the needle so that once aligned, all one has to do is drive the needle along a straight line that begins a fraction of a millimeter in front of the top forceps tip, that it's positioned at the exact position you want the wound edge to be, and exits the corneal margin just inferior to the other forceps tip, which has been pre-positioned barely above the deepest extent of the graft wound margin.

In the second act, we need to engage the cornea on the opposite margin in such a way that the suture is radial and also deep and parallel to the posterior surface of the cornea. In the third act, one needs a technique to have the needle point upwards to the surface at the exact distance from the wound margin that you plan. And you want this movement to be as an acute a right turn as possible, and not a slow sloping movement to the surface.

Finally, we want to tie the sutures so that the wound compression is just right, not too loose to leak, and not so tight that it induces a large amount of astigmatism. Each of these steps, which looks easy on a figure, actually has a number of setups steps that precede it. There are eight steps to pass the needle through the graft.

There are six steps to place the needle deep and parallel to the whole surface. There are three steps to bring the needle to the host surface. And then there are 12 steps to tie the suture. The next video in the series will describe the steps for placing the needle through the graft. I'm Leo McGuire, Mayo Ophthalmology, and stay tuned for part two.