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# Corneal Transplantation and Immunologic Tolerance

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Corneal transplants, more often than not, are "tolerated (i.e., not rejected), unlike solid organ transplants such as heart, lung, kidney and skin. For 40 years it was imagined that this phenomenon occurred because of the lack of blood vessels and lymphatics in the cornea, resulting in antigen "invisibility" of the foreign material (i.e., piece of cornea from an unrelated donor), from the recipient patient immune system, and therefore the lack of an immune response against the corneal transplant. Indeed, a British immunologist was awarded the Nobel Prize in Medicine in the early 1950's for his experiments on this topic, and his description of the phenomenon of immunologic tolerance.

It turns out, however, that the high success rate enjoyed by most corneal transplants is more complex than imagined 40 years ago. The foreign corneal antigens or proteins on the transplanted cornea are not invisible for the recipient's immune system, but rather are recognized very rapidly by the recipient's immune system. The thing is, however, rather than an "attack-and-destroy" immune response, a curious (and lucky for us) immune response develops in which regulatory cells which actively discourage the development of "attack-and-destroy" cells in the immune system are rapidly developed, and it is the continued activity of these regulatory cells which accounts for the tolerance of most corneal transplants. Tolerance can be interrupted or broken if the immune system is perturbed, particularly if it is "reved up" through an upper respiratory infection or immunization, with the result that "attack-and-destroy" types of immunologic cells suddenly do begin to attack the corneal transplant. In most instances, the patient and ophthalmologist will recognize this quickly, will treat the eye with frequent application of steroid eye drops, and will eventually be able to stop those eye drops, despite the fact that it is quite clear that the recipient immune system has now unquestionably recognized that foreign corneal transplant, and has made an immune response against it. But the temporary use of the steroid drops has allowed the brief perturbation in the immune system to subside and has enabled the patient's regulatory cells to once again gain the upper hand, mediating the continued freedom from transplant rejection.

The take home lessons most important from this story for patients are:

1. Corneal transplants have an extraordinarily high degree of success today;

2. Even if the patient develops an episode of corneal transplant rejection, recognition of the earliest signs and symptoms of that by the patient (discomfort, light sensitivity, redness, decrease in vision,) with prompt presentation to the ophthalmologist and recognition by that ophthalmologist that the earliest phases of a transplant rejection exist, will result in aggressive treatment of the transplant with steroid drops, and salvage of the transplant 90% of the time.