The Times of India
4th September 2025

Shortage of corneas: How clinical trials at AIIMS provide ray of hope

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New Delhi: For thousands of Indians who lose their eyesight because of corneal damage, the biggest hurdle is not the treatment itself. It is the acute shortage of donor corneas. Every year, only a fraction of patients on the waiting list receive transplants. Many continue to live a life of darkness.
Now, a joint team of doctors at AIIMS and researchers at IIT-Delhi may have found a way to change that. They have developed a bioengineered cornea that can be made from corneas usually considered "unfit" for transplant that are discarded.
After successful animal trials on rabbits, the team has now begun clinical trials at AIIMS. If the results are positive, this innovation could dramatically reduce dependence on scarce donor corneas and offer fresh hope to many thousands awaiting surgery. Dr Radhika Tandon, professor of ophthalmology at Dr Rajendra Prasad Centre for Ophthalmic Sciences (AIIMS), explained

that the bioengineered cornea does not contain any living cells. This is helpful in cases where the cornea has lost tissue but the cell layer beneath is still intact. For example, patients with partial corneal scars — where only the front surface is damaged — can receive the graft. Once placed, the bioengineered cornea merges with the natural cornea as the patient's own cells migrate to cover it.

It can also act as a patch graft in cases where the cornea becomes dangerously thin due to melting or infection. In such situations, instead of replacing the whole cornea, a small patch of bioengineered tissue can be applied to strengthen the eye. This targeted approach allows doctors to save vision without resorting to a full transplant. When eyes are donated, corneas go through a strict evaluation. Many are rejected as their cells are weak or infected and are diverted for training or research. But with bioengineering, these corneas can be salvaged. During the process, all the cells and any trace of infection are removed, leaving behind a clean scaffold that can integrate with a recipient's eye. "This means corneas once thought unusable can be brought back into the donor pool," Dr Tandon said. The technology being used was developed by Dr Sourabh Ghosh at IIT Delhi, who designed it specifically for Indian conditions. He built a perfusion bioreactor chamber, where donated corneas are placed and exposed to a controlled flow of buffer fluid delivered through a peristaltic pump. This gentle circulation washes away all cells—including those that are weak or diseased, but without damaging the tissue. The cornea is then strengthened using cross-linking, which enhances its structural integrity for safe transplantation. This innovation did not happen overnight. Scientists first tested if the bioengineered cornea was safe for cells to grow on. Using tissue culture techniques, they confirmed it was biocompatible, which means that cells attached to it and thrived without toxic effects. The next step was animal testing. Rabbits implanted with the bioengineered cornea showed great tolerance. The researchers have now advanced to the clinical trial stage at

AIIMS, bringing the promise of this technology closer to humans. If the trial proves successful, India may soon have a way to expand the availability of transplantable corneas, turning medical waste into a sight-saving resource. For patients, this would mean more than a treatment. It would be a second chance at vision, independence and life. For the past six years, AIIMS has performed over 1,000 corneal transplants annually. In 2024, 1,636 corneal blind patients received transplants. This is a utilisation rate of around 85%, well above the national average, showing AIIMS's role in tackling corneal blindness.