

Treatments may help people with aging eyes see up close without reading glasses

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Researchers are testing cutting-edge treatments for people who want to see up close without reading glasses and finding promising results, according to studies presented this week at AAO 2016, the 120th annual meeting of the American Academy of Ophthalmology. Credit: American Academy of Ophthalmology

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see up close without reading glasses and finding promising results, according to studies presented this week at AAO 2016, the 120th annual meeting of the American Academy of Ophthalmology. A new method that uses lasers to reshape a small part of the cornea, and a separate technique using painless electrostimulation, may be effective in treating presbyopia, the blurry near vision people develop around age 40.

For some adults, wearing reading glasses for [presbyopia](#) is not a welcome habit. This is not only due to the inconvenience of taking off and on the glasses, but also due to the aesthetic. For those patients who want to maintain a youthful appearance, reading glasses may not fit that desired image. Two treatments are in development that show potential as unique approaches to addressing this need.

One approach uses a femtosecond laser to extract a disc of [corneal tissue](#), which is then sculpted. This treatment may offer safety advantages over synthetic corneal inlays for presbyopia as it uses the person's own more biologically-compatible corneal tissue. The other is for people who have mild forms of the condition and uses electrostimulation to activate and exercise the [eye muscle](#) that controls near vision. The technique requires no surgery, providing a potential advantage over invasive presbyopia treatments.

Laser treatment improves near vision using the person's own corneal tissue

Surgical treatments for presbyopia are gaining popularity with recent U.S. Food and Drug Administration approvals of two types of corneal inlays, tiny lenses or optical devices that are inserted into the cornea to improve reading vision. One of the potential drawbacks of synthetic inlays is the patient's eye rejecting the artificial material. A researcher at Dr. Agarwal's Refractive and Cornea Foundation in Chennai, Tamil

Nadu, India, has developed a new technique that aims to address this issue and is studying its long-term safety and efficacy.

PEARL, or PrEsbyopic Allogenic Refractive Lenticule, is a new technique to correct presbyopia that involves the use of femtosecond lasers, which provide the ability to shape cornea with high precision. The PEARL procedure uses the laser to make a small cut in the cornea, the clear round dome at the front of the eye. A disc of corneal tissue, called a lenticule, is removed through this cut, using a technique called small incision lenticule extraction or SMILE. The SMILE technique permanently removes this tissue to reshape the eye and correct vision. In PEARL, the SMILE lenticule is cut to 1 mm and reshaped. This newly created inlay is placed into a pocket in the cornea of the presbyopic patient to improve near vision without significantly compromising distance vision.

Unlike current treatments for presbyopia that involve using a synthetic inlay to improve near vision, PEARL uses human corneal tissue. This reduces complications, including potential inflammation. In comparison to synthetic inlays, the PEARL inlay is expected to allow better oxygen and nutrient flow through the patient's cornea. A similar technique using human corneal tissue has already been used to treat other eye conditions, such as farsightedness.

In the study, researchers implanted inlays in the eyes of six patients. Recipients were tested within one week of having the procedure. Near visual acuity was measured using the Jaeger Eye Chart, a handheld card with lines of type that get increasingly smaller. When holding the chart 33 cm away, all showed improvement in uncorrected near vision of three to five lines. The researchers followed all of the patients for at least four months, and found that their vision remained stable. They also noted that, in those with reduced distance vision, LASIK can be performed at the same time as PEARL.

"The PEARL inlay changes the shape of the cornea to improve near vision," said Soosan Jacob, MD, FRCS, DNB, lead author and creator of the procedure who is also director and chief, Dr. Agarwal's Refractive and Cornea Foundation, and senior consultant, Cataract and Glaucoma Services, Dr. Agarwal's Group of Eye Hospitals, Chennai, Tamil Nadu, India. "Because it's made of human corneal tissue, the inlay remains stable. Our preliminary findings have been very promising."

Dr. Jacob has no financial interests to disclose.

Exercising the eye muscle that controls near vision

Near vision is controlled by the eye's ciliary muscle, which is located behind the lens of the eye. As this muscle contracts, it causes the flexible lens to change shape to enable seeing up close. With age, the lens becomes less elastic, weakening the muscle's ability to change the lens' shape effectively. This causes reading up close to become more difficult. Researchers at the Dignostica Oculistica e Microchirurgia Ambulatoriale in Rome, Italy, sought to determine whether strengthening the ciliary muscle using electrostimulation could correct presbyopia in people who were just starting to experience the condition.

Electrostimulation is a noninvasive technique that is used for a number of health issues, including treating other eye conditions, such as glaucoma and macular degeneration. In this study, the researchers treated 46 people who had mild presbyopia with electrostimulation. This involved placing on the eye a contact lens-shaped device that is connected to a micro-current generator via tiny cables. This provides a mild electric current to the eye to repeatedly activate and exercise the ciliary muscle, making it stronger. The patient feels a small, painless tingling in the eyeball and lid. Recipients had four eight-minute treatments in two months and then continued maintenance treatment once every three months. The researchers found that the procedure

improved patients' near vision.

Prior to having the procedure, the average clear near vision distance was about 43 cm. Forty-five days after having the procedure, the distance was 37 cm. That means the participants could see clearly an average of 6 cm closer, or a little more than 2-1/3 inches, than prior to the procedure. In addition, the overall near and intermediate vision increased by almost one line on the Jaeger Eye Chart. Researchers also noticed an increased lens thickness and a positive change in curvature in patients. Patients' distance vision was not affected.

The length of the benefit varied significantly between recipients. Some people required treatment every two months to maintain near [vision](#), while others maintained it for almost four months without treatment.

"This is like going to the gym. I tell patients electrostimulation helps them train their eye muscles to delay development of presbyopia," said Luca Gualdi, M.D., lead author of the study and a refractive and anterior segment surgeon at Dignostica Oculistica e Microchirurgia Ambulatoriale. "The key is early treatment. Electrostimulation is much more effective when it's performed in people who are early in the process of developing presbyopia before their eyes become dependent on reading glasses and the ciliary muscle is less reactive to treatment."

The device has received the CE Marking in Europe. It has not been submitted for FDA approval. The researchers note that studies with longer follow-up should be done to verify their findings.

Dr. Gualdi has no financial interests to disclose.

Provided by American Academy of Ophthalmology

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