SCIENCE NEWS of the week

Study Pans Surgery for Eye Disease

A controversial surgical procedure for a serious eye disorder not only doesn't work, it may make vision worse in some cases, warns a study published this week. Each year in the United States, surgeons perform more than 1,000 of these operations, mainly on older people.

The disorder, known as nonarteritic anterior ischemic optic neuropathy, is characterized by sudden loss of vision due to a painless swelling of the optic disc, a region at the back of the eye where the retina and the optic nerve join. The retina converts visual images to electric impulses that travel along the optic nerve to the brain for processing.

Beginning in 1989, several small studies suggested that this surgical procedure, which eases swelling, could improve vision for people afflicted with the disorder. The operation proved very popular. Nonetheless, many ophthalmologists continued to note that the surgery's worth had yet to be proved by a rigorous test.

In 1992, the federal government decided to change that by launching the "first large, randomized clinical trial looking at the safety and efficacy of the procedure," says Scott M. Whitcup, clinical director of the National Eye Institute in Bethesda, Md. A report in the Feb. 22 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (JAMA) describes the trial's results.

Investigators at 25 U.S. clinics recruited 244 men and women with nonarteritic anterior ischemic optic neuropathy. They randomly assigned 119 to receive surgery. The remaining 125 got no surgical treatment, but researchers monitored their vision closely.

After 6 months, 43 percent of the no-surgery group could see three or more additional lines of letters on a standard eye chart. In contrast, just 33 percent of the surgery group demonstrated the same boost in performance.

The findings suggest that many such patients improve on their own, without intervention. Previous studies had indicated that very few people would experience such spontaneous clearing of their vision.

The trial further indicated that 24 percent of the surgery group actually lost ground at their 6-month checkup, dropping three or more lines of vision. Only 12 percent of those in the no-surgery group suffered this same deterioration in their ability to read the chart.

"Three lines of vision is thought to be a significant amount of vision," Whitcup says. For someone with perfect eyesight, it would mean the risk of flunking the vision portion of the driving test, he adds.

Last October, the Data and Safety Monitoring Committee, an independent panel of scientists and ethicists appointed by the National Eye Institute to monitor the trial, recommended halting the study. After a careful review of the data, the institute issued a clinical alert to warn 25,000 doctors of the study's findings. "The National Eye Institute would recommend that this particular operation not be performed for this condition," Whitcup says.

Ophthalmologist Leonard A. Levin of the University of Wisconsin Medical School in Madison concurs. "Why do the surgery?" he told SCIENCE NEWS. "It definitely doesn't help."

In an editorial accompanying the JAMA paper, Levin says the procedure had gained widespread acceptance in recent years because of the desperate nature of this eye disorder. "Faced with a patient acutely blinded in one eye by a disease for which there is no known treatment, a compassionate physician might well consider any reasonable option."

The outcome of the new study underscores the value of such research. "The results from this study, although negative, bear witness to the immense power of the prospective, randomized, controlled clinical trial," Levin says in his editorial. *—K. Fackelmann*

Atomic refraction: Bending matter waves

When a light beam passes obliquely from air into water, its path doesn't continue along the same straight line it followed in air. It refracts, changing its direction of travel at the air-water interface.

The light wave also slows down as it enters the water. The ratio of the speed of light in a vacuum to its speed in water represents the water's index of refraction.

Now, researchers have determined the index of refraction not of light waves, but of beams of sodium atoms as they travel through different gases. Such measurements provide new insights into the forces that govern collisions between sodium atoms and various types of gas atoms.

David E. Pritchard of the Massachusetts Institute of Technology, Jörg Schmiedmayer of the University of Innsbruck in Austria, and their coworkers report their findings in the Feb. 13 PHYSICAL REVIEW LETTERS.

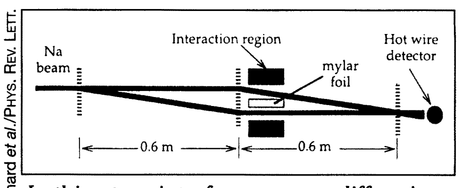
The researchers took advantage of the fact that sodium atoms can, under certain circumstances, behave more like waves than particles. Thus, two beams of sodium atoms can combine to produce an interference pattern. The pattern's "dark" areas indicate an absence of atoms where the matter waves cancel each other out, and "bright" areas show a surfeit of atoms where they reinforce each other (SN: 9/7/91, p.158).

"Atom interferometers are becoming a powerful tool in the field of atomic physics," the researchers note.

To measure the index of refraction that arises from sodium matter waves traveling through a gas, Pritchard and his colleagues split a sodium beam in two, then sent the two components along separate paths before recombining them (see diagram). By sending one of the components through a given gas, the researchers could determine its index of refraction from the change in the resulting interference pattern.

The researchers investigated the effect on sodium of the gases helium, neon, argon, krypton, and xenon. From their data, they calculated the refractive index of each gas, which provided new details about the long-range forces between the gas atoms and sodium atoms.

Of the gases studied, they discovered that helium atoms behave most like hard spheres in their interactions with sodium. These atoms exert the weakest long-range attraction. Xenon, on the other hand, has a strong long-range interaction, which plays a significant role in sodium-xenon collisions.



Pritchard et al./PHYS. REV. LETT.

In this atom interferometer, a diffraction grating (vertical dashed line) splits a sodium atom wave into two beams, which pass on either side of a sheet of Mylar foil, then recombine at a detector.

Significant discrepancies between the results of this experiment and predictions based on direct collision experiments suggest the need to refine how the long-range interactions between these atoms are characterized, the researchers suggest.

Pritchard and his collaborators hope to improve the sensitivity of their method to extract other details of the interatomic forces governing collisions between different atoms. *—I. Peterson*