By Adar Novak

VRT: Restoring Vision Loss

P&S NEUROLOGISTS ARE HELPING PATIENTS WHO HAVE LOST vision from strokes, brain tumors, or injuries to the head or optic nerve regain part or all of their vision with six months of a specialized kind of computerized physical therapy. An FDA-approved therapy, called Vision Restoration Therapy (VRT), developed by a company called NovaVision Inc. of Boca Raton, Fla., in 2000, is available at 11 U.S. sites, and already has been tested in Europe. VRT is based on the theory of neuroplasticity — the ability of the brain's nerves to compensate for those that have been traumatized by injury or neurological disease — which can aid patients in regaining their sight.

Thirty patients under the care of Randolph Marshall, M.D., associate professor of clinical neurology, are using the computerized device, which stimulates the limited areas of a patient's field of vision with images of flashing dots. The six-month regimen attempts to expand the patient's vision by enabling healthy neurons to compensate for damaged ones. Patients use the customized therapy in two 20- to 30-minutes sessions per day. For many patients, VRT has expanded their field of vision as much as five degrees or more (the difference between seeing half a page and a full page of text at arm's length, says Dr. Marshall).

The results of VRT so far are "fairly dramatic," Dr. Marshall says, with about 65 percent of his patients showing vision improvement of 20 percent or more after about three months. In studies conducted throughout Europe and the United States, the results are fairly consistent after the allotted six months of therapy: About a third of patients experience dramatic improvements, a third experience a "measurable response," and a third experience no change.

"Those seem to be the numbers regardless of age," Dr. Marshall says. "That includes the results for patients who have begun the therapy more than a year after having suffered a stroke."

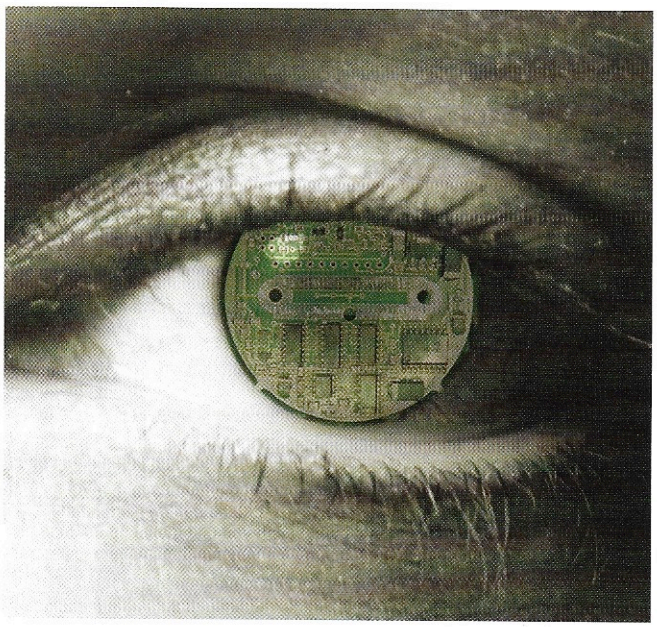
Patients using VRT usually don't experience additional benefits by undergoing the therapy for longer than six months, he says, but the improvements after six months have "reasonable staying power." Dr. Marshall says the staying power comes from patients using their eyes in the real world as they did when they were undergoing VRT. "The training process translates into day-to-day use."

Dr. Marshall adds that some improvements have been made to the therapy since it was developed in 2000. "VRT is now more portable than it was, so people who travel can carry it with them much more easily," he says. In the neurologist's office or at home, patients use VRT by sitting down and resting their chins in a plastic frame to keep their heads still while they look at a computer screen with the flashing dots. Now, the plastic frame is hinged and attached to the computer screen, so it is small enough for a patient to carry while traveling.

The biggest complaint among patients, Dr. Marshall says, is that the therapy is "tedious, boring, and hard work." But in that regard it is similar to other kinds of physical therapy; it's based on the notion that patients are more likely to improve with repetitive stimulation.

While Dr. Marshall tracks the effectiveness of VRT, he also has begun a pilot project to study the mechanisms of neuroplasticity using functional magnetic resonance imaging (fMRI). "The goal of the MRI study is to demonstrate the neuroplasticity we presume underlies the recovery we are seeing in our patients," Dr. Marshall says.

"This would be the first-ever demonstration of such neuroplasticity in humans undergoing therapy for visual loss. I am cautiously optimistic that we finally have the opportunity to offer real hope to patients with visual loss after stroke and other brain injuries."



A Robot Named Penelope

"WHERE'S MY PENELOPE?"

That's what Michael R. Treat, M.D., associate professor of clinical surgery, hopes all surgeons will ask in their operating rooms soon. Penelope is a robot designed to help out in the operating room.

"She" isn't intended to replace nurses and other OR personnel, but to free them for other responsibilities. Penelope will identify and track surgical instruments, hand instruments to surgeons, retrieve instruments, and put them back in place. The robot is intended to save time and increase efficiency in the operating room by tracking instruments that are sometimes lost during procedures and speeding surgeries.

Dr. Treat created the robot through Robotic Surgical Tech Inc. of New York, a Columbia and New York-Presbyterian Hospital spin-off company he founded in 2002.

Penelope, whose full name is Penelope Surgical Instrument Server, was built with voice recognition software so the surgeon can ask for instruments; a gripper to place tools in the surgeon's hand; and digital cameras and image processing software to recognize a tool and return it to its proper position. The robot also has software that predicts which instrument will be needed and offers a detailed count of all instruments.

Penelope made surgical history in June 2005 when she scrubbed in on her first surgery, aiding Spencer E. Amory, M.D., director of surgery at the Allen Pavilion of NewYork-Presbyterian, in the removal of a benign tumor from a patient's forearm. It marked the first time a robot functioned independently based on a surgeon's instructions. Dr. Treat said the patient was thrilled to have a robot participate in the procedure.

"We've got something really good here," Dr. Treat says while proudly viewing the videotape of Penelope's first surgery. "This is a machine that involves artificial intelligence, computer vision, and robotic manipulation. It has all the components to evolve and become a real helper in the operating room."

Reviewing the procedure, Dr. Treat noted that some of Penelope's kinks need to be worked out before she's mass produced for more operating rooms. "She needs to become more robust," Dr. Treat says, which will happen when her engineers supervise her surgeries so they can fine-tune her. Once she's "grown up," Dr. Treat says, Penelope can be mass produced, and the company can start to develop her "descendants" — other surgical helpers. They estimate that surgical robots will cost about the same as other minor capital equipment in the operating room, such as a portable X-ray machine, which runs about $150,000.

Dr. Treat says his first surgery with Penelope felt like a comfortable partnership, adding that the procedure marked not only a technological and surgical milestone but also one in the history of human — that is, robot — relations.

"Right now," Dr. Treat says, "robots are working in heavy industry behind cages. We brought a robot into a human situation." That's an atmosphere he envisions for all operating rooms. "That's where we're going."