Biomedicine

Brain angioplasty may prevent strokes

For thousands of heart-disease patients, angioplasty has obviated the need for surgery. In this technique, surgeons thread a catheter tipped with a tiny inflatable balloon through an artery until it reaches a blockage. They gently inflate the balloon to widen the opening and restore blood flow to heart muscle.

This procedure also works on arterial blockages in the brain, scientists report in the May STROKE.

Researchers at Stanford University Medical Center tried the procedure on 23 patients at high risk of stroke. In these people, blood flow through at least one major brain artery had slowed substantially. Ten had already had strokes, and symptoms of all were worsening as drugs failed to relieve the condition. The arterial blockages had forced some to curtail their activities greatly and even rendered some bedridden.

All the patients underwent angioplasty in a brain artery except one who had a blockage that doctors couldn't safely treat. This patient died soon afterward. Another patient died during surgery.

Most of the other 21 patients have done well, considering their poor prognoses at the start of the experiment, says study coauthor Michael P. Marks, a neuroradiologist at Stanford. They continued on medication, and during a follow-up period averaging 3 years, only two patients in this group had strokes. One of those was due to a blockage in a brain vessel other than the one that underwent angioplasty.

These results translate to an annual stroke rate of only 3.2 percent, significantly less than the 7.8 to 10.7 percent rate typical of patients with such blockages. The actual gains from angioplasty might be even greater, says Marks, considering that unlike most such patients, these had not been responding to drug therapy. The study's success rate indicates that the procedure is a potential weapon against stroke, Marks says.

The researchers have now followed some of their patients for as long as 6 years after the angioplasties. "Many of the patients were really helped," Marks says.

To more fully ascertain the treatment's benefits, Marks is calling for a larger study to compare stroke-risk patients receiving only medication with those getting medication plus angioplasty. *—N.S.*

Brain anomalies seen in former preemies

Infants born 5 weeks premature are more likely to have abnormal brain scans, reading troubles, and behavioral problems in adolescence than are children born after a full-term pregnancy.

A British study of 72 prematurely born children finds that at 14 to 15 years old, 40 showed brain abnormalities in magnetic resonance images (MRIs). The abnormalities included dilation of the brain cavity holding cerebrospinal fluid and a thinning of nerve fibers that link the two hemispheres of the brain. Of 21 adolescents born full term, only one had an abnormal MRI, researchers report in the May 15 LANCET.

The study is the first follow-up of children born preterm that includes MRIs, says coauthor Ann L. Stewart of the University College London Medical School.

Eleven of the 40 adolescents with abnormal MRIs had a history of aberrant behavior, compared with 5 of 32 other preterm children and only 1 of the 21 children in the control group.

Nine of the 40 had needed extra tutoring or repeated a grade in school, compared with 5 of the other preterm children and only a single control. Also, the preterm children had an average "reading age" that was 1 to 2 years lower than the controls'.

Stewart notes that the control children generally were in families at a higher socioeconomic status than the families of the children born preterm.

While many people who have abnormal brain scans are not considered brain damaged, the abnormalities in these children reflected measurable behavioral deficits, Stewart says. *—N.S.*

Physics

New shards of electron charge found

When electrons get together, strange things can happen.

Physicists have long suspected, for instance, that electrons can clump into composite particles, known as quasiparticles, each with a third or less of the electric charge of a single electron. These composites had been expected to appear when ultracold electrons are flowing within an extremely thin layer between two slabs of semiconductor and, in addition, a powerful magnetic field cuts through the layer.

Two years ago, Israeli and French scientific teams independently demonstrated the existence of quasiparticles with one-third charges. Now in the May 20 NATURE, the Israeli team, located at the Weizmann Institute of Science in Rehovot, reports also bagging evidence for quasiparticles with one-fifth charges.

In all the cases, the scientists determined quasiparticle charge by analyzing the electrical noise created when quasiparticle currents funneled through very narrow regions of the thin layers.

"To observe these unusual creatures, you need unusual circumstances," says Rafi de Picciotto, a member of the Israeli team who is now at Lucent Technologies' Bell Labs in Murray Hill, N.J.

Studies of electric flows under similar circumstances created a huge sensation in physics 17 years ago. Physicists had long known that the presence of a magnetic field perpendicular to the thin layer creates a sideways current, a phenomenon known as the Hall effect. They had also determined that, at very low temperatures, the electrical resistance to that current increases in steps proportional to the charge of the electron.

Then in 1982, Daniel C. Tsui of Princeton University and Horst L. Störmer, now at Columbia University, made the puzzling discovery that there are additional resistance steps, which are proportional to fractional charges. To explain them, Robert B. Laughlin, who is now at Stanford University, came up with a theory involving quasiparticles. The three scientists won the Nobel Prize in Physics last year for their findings (SN: 10/17/98, p. 247).

De Picciotto says that the new results support Laughlin's predictions. Many quasiparticle partial charges form, equal to certain fractions with odd denominators, but they don't always directly correspond to the fractional resistance steps. *—P.W.*

Revived collider seeks physics firsts

The world's highest-energy particle accelerator has fired up again after a 3-year shutdown. Newly completed renovations, which began 8 years ago, are expected to boost by a factor of 10 the number of proton-antiproton collisions produced in the Tevatron at the Fermi National Accelerator Laboratory in Batavia, Ill. (SN: 7/1/95, p. 10).

To upgrade the Tevatron, Fermilab built a new, $260 million, subordinate accelerator, known as the Main Injector, that's 2 miles in circumference. It creates four times as many antiprotons to feed to the main Tevatron ring as did its predecessor accelerator. Energy Secretary Bill Richardson and other dignitaries dedicated the new injector on June 1.

Extensive overhauls of the Tevatron ring's two main detectors—to be completed by early next year—will wring more information from the higher collision rate. Altogether, these upgrades should open up new realms of physics to experimental exploration, Fermilab scientists say.

The improvements will "make us really the world center for physics" until roughly 2006, says Joseph Lykken of Fermilab. That's when the Large Hadron Collider, an accelerator now being built in Switzerland, is slated to start up.

Until then, the renovated Tevatron will have first shot at such prizes as the long-sought Higgs boson and so-called supersymmetric particles, he says. Finding the Higgs particle may solve the mystery of why matter has mass. Supersymmetric particles might reveal hidden links between the particles that carry forces and those that make up matter. *—P.W.*