Behavior

Bruce Bower reports from New York City at the International Conference on Electroconvulsive Therapy

The patients' perspective on ECT

Electroconvulsive therapy (ECT), commonly known as shock treatment, has a bad public image, as psychiatrists are well aware. In prior decades, that image was fueled by an unfortunate tendency of some physicians to use ECT on a variety of psychiatric patients and to induce 50 or more brain seizures during a course of treatment. These days, ECT is used almost exclusively with severely depressed patients who do not respond to antidepressant drugs, and a normal course of treatment ranges from 6 to 10 seizures.

Are the patients who receive up-to-date ECT satisfied with it? In what is perhaps the first systematic attempt to measure patients' reactions to ECT, Christopher Freeman and colleagues of Royal Edinburgh (Scotland) Hospital report both reassuring and disturbing responses.

The researchers interviewed 106 patients who had had a course of ECT at the Edinburgh hospital one year earlier. Over three-quarters said that ECT had helped them and that they would undergo the treatment again if necessary. Half the patients said that a dental checkup would be more frightening than returning for ECT. But nearly half of the sample reported receiving no explanation of the need for ECT and its risks before starting treatment. Informed consent was given, says Freeman, but ECT often causes permanent memory loss for events from the week or two before the first treatment.

"In all cases, explanations about ECT should be repeated after treatment begins because of these memory losses," Freeman suggests. Consent procedures, however, were not in great demand by the former patients. Nine out of 10 said that it is a physician's decision to use ECT, and informed consent is not necessary—an attitude that Freeman finds "worrisome."

In a second study, 26 patients who complained of persisting memory impairment after ECT were compared with 13 noncomplaining ECT patients and 53 normal controls. The investigators found that the memory loss was associated with ECT, and not age, drug use or other factors, in the group with persisting complaints.

Of mice and men . . . and depression

Scientists in England, Sweden and the United States are finding that a seizure-inducing shock, or series of shocks, inhibits the synthesis of a number of chemical messengers in the brains of rats and mice. These messengers, or neurotransmitters, include gamma aminobutyric acid (GABA) and serotonin.

Another group of brain chemicals, the naturally occurring opiates, also appear to respond to shock treatments, reports John W. Holaday of Walter Reed Army Institute of Research in Washington, D.C. Repeated shocks administered to rats activate their opiate systems and increase opiate binding sites, he says. Brain opiates, along with some neurotransmitters, may help to quell a convulsion, adds Holaday.

Animal researchers hope to unravel the biological effects shared by ECT and antidepressant drugs. They also want to come up with more effective drugs to treat depression.

Some clinicians who use ECT, however, have reservations about the validity of such animal research. Animal models of depression do not translate well to humans, they point out; there is no reason to assume that shocks or drugs are relieving an underlying pathology in rats, even if brain chemicals are affected. Another problem is that ECT may act upon the brain in ways that are different from the action of antidepressants.

Says animal researcher Kenneth J. Kellar of Georgetown University in Washington, D.C., who studied the effects of shocks on serotonin, "Animal investigations are going to be replicated in living human neurotransmitter receptors by using positron emission scanners and nuclear magnetic resonance. Then the animal data will be historical."

Technology

Picturing an electric look

Almost 150 years ago, Louis Daguerre introduced a remarkable photographic process that produced crisp, luminous, delicately shaded images on polished silver plates. Although these "daguerreotypes," as the photographs were called, were highly praised for their quality, Daguerre's technique quickly lost out in favor of safer and more convenient photographic methods. Nevertheless, the matter of how daguerreotype images form has been a longstanding scientific question.

The answer, say Ivor Brodie and Malcom Thackray of SRI International in Menlo Park, Calif., is that the Daguerre photographic technique is not so much a chemical process as it is an electrostatic process akin to xerography. Says Brodie, "I think it's just possible that had they [150 years ago] realized the mechanism was physical, xerography might have taken off a lot earlier than it did."

In the Daguerre photographic process, a polished, silver-coated plate is exposed to iodine vapor to form a silver iodide film across its surface. After the coated plate is exposed to light, mercury vapor condenses on the plate wherever light has fallen, amalgamating with silver liberated from the silver iodide. A sodium thiosulfate solution dissolves away the remaining silver iodide. The resulting photograph shows a positive image. At most viewing angles, areas of polished silver appear black while areas where mercury was deposited look lighter.

It was the fine detail visible in these images that led Brodie to suspect that electrostatic processes were involved. "In xerography, under certain conditions you sharpen edges," he says, "and daguerreotypes are extremely sharp, beautifully crisp pictures." First, Brodie and Thackray demonstrated that mercury vapor in air contains electrically charged droplets. Then, they showed that a silver plate coated with a thin film of silver iodide develops a negative charge when it is exposed to light. Hence, positively charged mercury droplets could find their way to these negatively charged areas to develop the image.

The researchers discovered that liquid toners used in photocopying processes also develop daguerreotype plates. They conclude that photographers wishing to make daguerreotypes could use a liquid toner made up of extremely fine, positively charged particles of a white powder such as titanium dioxide instead of resorting to toxic mercury vapor. "It makes the daguerreotype a little safer to produce," says Brodie.

A new mystery, however, concerns how the silver iodide film becomes charged. "I think it's an interesting scientific phenomenon and is perhaps worth following up," says Brodie. In their report, which appears in a recent issue of NATURE (Vol. 312, p. 744), the researchers also suggest, "... a photographic transfer process could possibly be based on easily prepared Daguerre surfaces."

Putting on a glassy coat

A thin coating of glass is often used to protect or electrically insulate metal and ceramic surfaces. A new technique, developed by C. Jeffrey Brinker and Scott T. Reed of the Sandia National Laboratories in Albuquerque, N.M., now promises to produce these films at temperatures less than 1,000°C.

The technique involves dispersing glass powders in a chemical solution called a sol-gel, a jellylike mass of alcohol and metal oxides. The surface to be coated is dipped in this solution or sprayed with the mixture. At room temperature, the solution sets to form a hard, brittle solid that bonds the powdered glass together and ensures that the film sticks well to a surface. Heating the film melts the glass particles and converts the porous sol-gel into a dense, glassy layer. With the use of glass powders that melt at low temperatures, even materials like nickel and copper, which can't tolerate excessive heat, can readily take on a glassy coat.

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