

Compression Saves Brain Tissue

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sions," said the authors of the 2005 AHA Guidelines for CPR and ECC (emergency cardiovascular care) published in a supplement to *Circulation* (www.circulation-aha.org).

The guidelines are aimed at improving the survival rate for out-of-hospital cardiac arrest, which "remains low worldwide, averaging 6% or less," Mary Fran Hazinski, R.N., of Vanderbilt Children's Hospital, Nashville, Tenn., and her colleagues noted in an accompanying summary of the key changes from the previous guidelines, issued in 2000 (*Circulation* 2005; 112:IV206-IV211).

And while the research behind the new guidelines included debate about all aspects of detection and treatment of cardiac arrest, "the last summation returned to the beginning question: How do we get more bystanders and health care providers to perform CPR and to perform it well?" they said.

"Our greatest challenge and highest priority is the training of lay rescuers and health care providers in simple, high-quality CPR skills that can be easily taught, remembered, and implemented to save lives," according to Ms. Hazinski and her associates. Evidence shows that "few victims of cardiac arrest receive CPR, and even fewer receive high-quality CPR."

To address this issue, the authors recommend a simplification of previous instructions on CPR, with a stronger emphasis on continuous chest compression with minimal interruptions for ventilation and rhythm checks.

"The combination of inadequate and interrupted chest compressions and excessive ventilation rates reduces cardiac output and coronary and cerebral blood flow and diminishes the likelihood of a successful resuscitation attempt," they said.

Thus, a universal compression-ventilation ratio of 30:2 for all lone rescuers (lay or trained) of victims of any age (excluding newborns) is recommended. Children can be treated using a 15:2 ratio if there are two rescuers present, since asphyxial arrest is more likely in this population. And a priority for ventilation was reaffirmed in the case of newborn resuscitation.

Dr. Coplin and cardiologist Dr. James J. Ferguson III, of Baylor College of Medicine, Houston, and the Texas Heart Institute of St. Luke's Episcopal Hospital there, agreed that the new guidelines promise to be useful in overcoming hesitance from bystanders who are worried about disease-exposure with mouth-to-mouth resuscitation. "By stressing the importance of chest compressions this may sidestep some of those issues, but it raises the concern that later on in the resuscitation efforts, when ventilation becomes more important, that it may be ignored to some extent," Dr. Ferguson said in an interview. However, he said that "the working philosophy of 'keep it simple and maximize your early benefit' would seem to provide the most benefit to the most people. Many more people who are saved are saved early, rather than late."

Dr. Coplin also agreed with the effort to simplify procedures. "This isn't supposed to be rocket science. The idea is to keep things under control until the rocket scientist is available."

Dr. Coplin said that he was disappointed with the guidelines' failure to fully endorse therapeutic hypothermia to improve neurologic outcome in comatose survivors of cardiac arrest.

"I wish they hadn't been so soft about it. It is a very soft endorsement, and I don't understand why," said Dr. Coplin, who also works in the department of neurolo-

gy and neurologic surgery at Wayne State University. Citing three studies showing improvement in patients treated with hypothermia, the guidelines state that both permissive hypothermia and active induction of hypothermia play a role in postresuscitation care. However, although mild spontaneous hypothermia (defined as more than 33° C) "may be beneficial to neurologic outcome and is likely to be well tolerated," active induction of hypothermia may only be beneficial to a subset of unconscious, hemodynamically stable adults with a return of spontaneous circulation after an out-of-hospital ventricular fibrillation cardiac arrest, according to the guidelines.

Although the guidelines' recommendation for therapeutic hypothermia is a class IIa rather than a class I recommendation, this should still be interpreted as a strong endorsement—especially because the issue was not even addressed in the previous 2000 guidelines, said Dr. Robert O'Connor, one of the authors of the guidelines.

"We actually issued interim recommendations in 2002 encouraging the use of therapeutic hypothermia because we felt it was so important to endorse it that we couldn't wait until the 2005 scheduled revision," said Dr. O'Connor, director of the emergency medicine program at Christiana Care Health System in Newark, Del., and professor of emergency medicine at Jefferson Medical College, Philadelphia.

But there have been practical problems with implementing a hypothermia protocol, Dr. O'Connor added, including issues such as temperature overshoot (in which the patient became too cool) and inadvertent rewarming. It's also not clear from

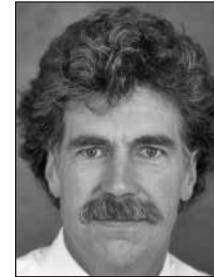
current evidence whether this protocol applies to arrest conditions other than ventricular fibrillation," he explained. "So we still recommend it, but with a word of caution."

The main change in the guidelines concerning defibrillation is the recommendation for only one shock rather than three, and the emphasis on immediate postshock chest compressions and CPR, rather than rhythm checks.

"This change is based on the high first-shock success rate of new defibrillators and the knowledge that if the first shock fails, intervening chest compressions may improve oxygen and substrate delivery to the myocardium, making the subsequent shock more likely to result in defibrillation," said Ms. Hazinski and her associates. Although lay rescuers are encouraged to use automated external defibrillators as soon as possible, emergency medical service providers "may consider about five cycles (or 2 minutes) of CPR before defibrillation for unwitnessed arrest," they suggested.

The first rhythm check should be done about 2 minutes after defibrillation and every subsequent 2 minutes. Vasopressors and antiarrhythmics should be administered as soon as possible after a rhythm check.

For acute ischemic stroke, there was reaffirmation of the previous recommendation to use tissue plasminogen activator (TPA) therapy "when administered by physicians in hospitals with stroke protocols that rigorously adhere to the eligibility criteria and therapeutic regimen of the National Institute of Neurological Disorders and Stroke (NINDS) protocol," Ms. Hazinski and her associates said. ■



The emphasis on chest compression may lessen concerns about disease transmission.

DR. FERGUSON

Nerve Transplantations and Transfers Can Restore Function

BY DEBORAH LEVENSON
Contributing Writer

Although nerve transplantations are rarely performed, they can provide an alternative to amputation, and some surgeons say they should be considered for seriously injured patients.

Surgeons interviewed for this article identified a total of nine neurosurgeons and plastic surgeons, including themselves, who have transplanted nerves from living donors for more than 10 years.

The surgeons believe that thousands of patients—including soldiers returning from Iraq—could benefit from transplantations and similar procedures. Soldiers who suffer blunt injuries to an isolated spot of nerve would be especially good candidates, said Dr. Andrew Elkwood in an interview.

Dr. Susan Mackinnon, a plastic surgeon at Washington University in St. Louis, performed the first nerve transplantation from a live donor in 1989 in Canada. Transplantation is used as a last resort if patients do not have enough of their own nerve tissue for a graft, she said.

Grafts of patients' own nerve tissues have been around for years, said Dr. Elkwood, a plastic surgeon who practices in New Jersey.

Both surgeons prefer live donors over cadavers for transplantations because family members usually are willing to donate nerve tissue immediately and such tis-

sue is less likely to be rejected than cadaver tissue. It can take several months to find an appropriate cadaver, they added.

The ideal time for a transplantation is 3 months after injury, according to Dr. Elkwood.

In November, Dr. Allan Belzberg, a neurosurgeon at Johns Hopkins University, performed his first allograft transplantation of nerves from a 40-year-old mother to her 19-year-old son, to restore the use of his hand 1 year after an automobile accident left him with left leg amputation and 14-cm gaps in the median and ulnar nerves of the left arm going to the hand.

Dr. Belzberg opted against an autologous graft of expendable leg nerves because the patient had already lost one leg and the other had been broken in seven places. Nor did he want to remove nerves from the patient's one good arm.

Dr. Belzberg harvested nerves from the mother's legs and arms.

Within 3 months, Dr. Belzberg should know if the patient's nerves have regenerated. If all goes well, he will regain motion in his fingers within 8 months and, within 2 years, bend his elbow, grasp with his fingers, and feel protective sensations such as pain, cold, and heat, Dr. Belzberg said. He estimated the chances of achieving these outcomes as 50%-75%.

The patient will take the immunosuppression drug tacrolimus (FK 506) for about 2 years. One side effect of

the drug is nerve growth, but Dr. Belzberg said he and a team of other doctors believe the drug is unlikely to spur tumor formation.

Dr. Mackinnon and other surgeons are now using another technique, nerve transfer, to treat patients in whom part of the brachial plexus has been torn. Nerve transfer consists of sacrificing the function of expendable portions of a patient's healthy nerves to revive function in a seriously injured, more crucial nerve.

Bundles of a healthy nerve near the motor end plate of the damaged muscle are teased apart and redirected to revive function in the recipient nerve and muscle. No grafting is necessary.

The technique changes the nerve injury from a proximal injury to a distal one, so nerves—which regenerate only about an inch a month—have less distance to grow, Dr. Mackinnon said.

For example, an injury to the ulnar nerve in the upper arm can require 2 years of recovery after grafting. But "stealing" nerve fibers from the pronator quadratus would require only a few months of recovery, Dr. Mackinnon said.

"There's a strong need for these procedures [transplantations and transfers]," Dr. Elkwood said, adding that too many physicians are unaware they are being done successfully. "We need massive education [about these procedures]. They need to become more mainstream in the lay and medical communities," he said. ■