

## Letters

### Electric- and Lightning-Induced Cardiac Arrest Reversed by Prompt Cardiopulmonary Resuscitation

*To the Editor.*—In their article entitled "Prehospital Cardiopulmonary Resuscitation: Is It Effective?" Cummins and Eisenberg<sup>1</sup> state: "Clinical evidence provides strong support for efforts to increase the percent of persons in cardiac arrests who receive early bystander CPR [cardiopulmonary resuscitation]. These efforts do no harm and clearly save lives." We wish to report a subgroup of patients in whom early bystander-initiated CPR may be dramatically successful.

Cardiac arrest induced by lightning or electricity is a unique injury because all patients may survive if CPR is promptly instituted. The potential success rate in this subgroup can be compared with success rates for resuscitation attempts in the hospital and in the community. When CPR is commenced in the hospital, a success rate of 56% has been reported.<sup>2</sup> Figures for resuscitation in the community are more difficult to interpret as reported by Cummins and Eisenberg, who have reviewed the results from nine centers over the last decade.<sup>1</sup> Because some patients are left with a residual neurological deficit, any evaluation of the success of resuscitation must therefore take into account the neurological outcome as well as survival.<sup>3</sup>

*Report of Cases.*—We report three patients with high-voltage electrical injuries and one patient with a lightning injury who were successfully resuscitated after cardiac arrest. The first patient, a 10-year-old boy, was found apneic and pulseless by his mother five to ten minutes after he was hit by lightning. She commenced CPR for eight minutes while awaiting the arrival of trained personnel. After admission to hospital, the patient was ventilated and had frequent runs of ventricular tachycardia. Levels of the MB isoenzyme of creatine phosphokinase were elevated and changes suggestive of an acute inferior myocardial infarction developed but later resolved. The patient recovered but had amnesia for the event and experienced personality changes.

Two firemen who sustained injuries from line voltages of 8,000 and 33,000 V, respectively, were resuscitated by their colleagues at the time of injury. One patient required a forequarter disarticulation, although neither patient developed

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electrocardiographic abnormalities or elevated cardiac enzyme levels. Another patient contacted a 7,000-V source at work and was resuscitated by a bystander. Subsequent cardiac monitoring revealed no abnormality and no change in enzyme levels was detected. All three patients recovered and have no symptoms referable to the cardiovascular or neurological systems on follow-up that ranges from three to seven years.

*Comment.*—Optimally, CPR should commence on cessation of the circulation. Because of the peculiar pathophysiology of lightning injury, delayed resuscitation may be effective. It has been suggested that all cellular metabolism ceases at the instant of the strike, thereby slowing cellular degeneration.<sup>4</sup> Also, although the pathophysiology may be different, every effort should be made to resuscitate patients who are apparently dead after electrical injury.

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2. De Bard ML: Cardiopulmonary resuscitation: Analysis of six years' experience and a review of the literature. *Ann Emerg Med* 1981;10:408-411.

3. Minoja G, Bandera A, Sala R, et al: Out-of-hospital cardiac arrest: Six-month follow-up. *Lancet* 1985;2:775.

4. Taussig HG: Death from lightning: The possibility of living again. *Ann Intern Med* 1968;68:1345-1353.

### Response to Deltoid Muscle Injection of Hepatitis B Vaccine After Failure to Respond to Gluteal Injections

*To the Editor.*—We recently reported a multivariate analysis of the risk factors associated with a poor immunogenic response to the hepatitis B plasma vaccine among 194 employees of a community hospital.<sup>1</sup> The vaccine had been stored and administered according to manufacturer's recommendations. Employees received all three doses of the vaccine in the buttock with a 2.5-cm, 23-gauge needle. Overall, only 56% (108/194) of the employees developed antibody to hepatitis B surface antigen (anti-HBs) as measured by the enzyme-linked immunosorbent assay (Abbott). A high body weight-height index (a measure of obesity) was found to be predictive of a lack of antibody response.

To date, 41 of the 86 employees who initially failed to develop anti-HBs have received two additional doses of the vaccine in the deltoid using a 2.5-cm, 23-gauge needle. The initial repeated immunization was con-

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ducted  $425 \pm 15$  days after the completion of the primary series, and the second immunization  $34 \pm 1$  days later. Repeated anti-HBs determinations were done  $95 \pm 1$  days after the last vaccine dose by radioimmunoassay (Ausab, Abbott). Overall, 75.6% (31/41) of the employees had substantial detectable anti-HBs (ratio of test sample value to mean negative control value [P/N ratio],  $>10$ ), an additional 14.6% (6/41) had low-level reactivity in the test (P/N ratio, 2.1 to 10), while only 9.8% (4/41) had no detectable antibody (P/N ratio,  $<2.1$ ). Among poor responders (P/N ratio,  $\leq 10$ ), seven of ten had a weight-height index greater than the sex-adjusted 75th percentile for US citizens, as compared with only 11 of 31 responders (P/N ratio,  $>10$ ) ( $P=.061$ , two-tailed Fisher's exact test).

We conclude that for subjects who remain seronegative after three doses of the hepatitis B plasma vaccine given by buttock injection, two additional intramuscular doses into the deltoid lead to development of anti-HBs in the vast majority of cases.

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### The Retrieval of Medical Literature

*To the Editor.*—The article and editorial about MEDIS, the full-text medi-