

# Medical Aspects of Lightning

## How Big A Problem Is This? Statistics

Lightning has been the second largest storm killer in the US for the last forty years, exceeded only by floods. The only cause of death from lightning is from cardiac arrest at the time of the injury, although some may appear to have a delayed death a few days later if they are resuscitated but have suffered irreversible brain damage.

According to 'Storm Data', a National Weather Service publication, an average of 73 lightning fatalities occur each year. Due to underreporting, the figures are more realistically about 100 deaths per year. Only about 10% of people who are struck are killed, leaving 90% with various degrees of disability.

| ODDS OF BECOMING A LIGHTNING VICTIM                                                          |             |
|----------------------------------------------------------------------------------------------|-------------|
| US 2000 Census population                                                                    | 280,000,000 |
| Odds of being struck by lightning in a given year<br>(reported deaths + injuries)            | 1/700,000   |
| Odds of being struck by lightning in a given year<br>(estimated total death + injuries)      | 1/240,000   |
| Odds of being struck in your lifetime (est. 80 years)                                        | 1/3000      |
| Odds you will be affected by someone being struck (Ten people affected for every one struck) | 1/300       |

## Affects on the Family

While any death is a blow to a family, eventually the family readjusts and goes on. However, for those who have a relative who suffers significant disability from lightning, life changes forever and the dreams of that family and the survivor may be markedly altered. The family income may be tremendously decreased if the survivor was one of the breadwinners or the spouse or another family member may have to quit work to care for the survivor if the disability is great enough.

## Who Gets Injured

While about one third of all injuries occur during work, workers compensation companies are often reluctant to acknowledge the injury or pay their medical expenses. About another third of

injuries occur during recreational or sports activities. The last third occurs in diverse situation, including injuries to those inside buildings.

## **Injury Prevention**

Many injuries in each of these groups can be prevented with: Proper education about lightning risks and safety measures; Well conceived lightning protection systems that protect people and equipment.

## **Safe places for people**

Lightning safety plans for coaches, parents, and referees at sporting events and other outdoor group activities should be prepared. While lightning safety and injury prevention may be judged to be an individual responsibility and decision for an adult, adults should be aware that they are ALWAYS responsible for the children in their care, particularly if it is an outdoor activity such as soccer, t-ball, camping, etc. Unlike high voltage electrical injuries, where massive internal tissue damage may occur, lightning seldom causes substantial burns. In fact, most of the burns are caused by other objects (rainwater, sweat, metal coins and necklaces, etc) being heated up and causing the burn rather than caused by the lightning itself.

## **How Does Lightning Injury Affect People?**

Lightning tends to be a nervous system injury and may affect any or all parts of the nervous system: the brain, the autonomic nervous system, and the peripheral nervous system. When the brain is affected, the person often has difficulty with short-term memory, coding new information and accessing old information, multitasking, distractibility, irritability and personality change. A great quote sums it up perfectly:

"Patients have difficulty in all areas that require them to analyze more items of information than they can handle simultaneously. They present (appear) as slow because it takes longer for smaller than normal chunks of information to be processed. They present as distractible because they do not have the spare capacity to monitor irrelevant stimuli at the same time as they are attending to the relevant stimulus. They present as forgetful because while they are concentrating on point A, they do not have the processing space to think about point B simultaneously. They present as inattentive because when the amount of information that they are given exceeds their capacities, they cannot take it all in."

Early on, survivors may complain of intense headaches, ringing in the ears, dizziness, nausea, vomiting and other post-concussion types of symptoms. Survivors may also experience difficulty sleeping, sometimes sleeping excessively acutely after the injury but changing during the next few weeks to inability to sleep more than two or three hours at a time. A few may develop persistent seizure-like activity several weeks to months after the injury.

## **Personality Changes / Self-Isolation**

Many may suffer personality changes because of frontal lobe damage and become quite irritable and easy to anger. The person who wakes up after the injury often does not have the ability to express what is wrong with them, may not recognize much of it or deny it, becomes embarrassed when they cannot carry on a conversation, work at their previous job, or do the same activities that they used to handle. As a result, many self-isolate, withdrawing from church, friends and other activities. Friends, family and co-workers, who see the same external person, may not understand why the survivor is so different. Friends soon stop coming by or asking them to participate in activities. Families who are not committed to each other break up. Obviously, depression becomes a big problem for people who have changed so much and lost so much. Suicide is something that almost all severely injured people have thought about at one time or another. Occasionally, those who do not have access to medical care or who do not understand what is happening may self-medicate with alcohol and other drugs, particularly those who have previously sought solace with these compounds. It is very important that the family and friends of the survivor maintain supportive contact even though it requires an adjustment in their relationship with the survivor. An injury such as this is an injury to the family, not just to the person hit.

## **Fatigue**

Survivors often complain of easy fatigability, becoming exhausted after only a few hours of work. This may be because every task that they used to automatically do without thinking now requires intense concentration to accomplish. Many return to work but find that they cannot multitask and do all of the activities that are required at their job.

## **Medical Testing**

There are two kinds of medical tests: anatomic tests take a simple picture (x-ray) or measurement (blood count) functional tests show how something is working (PET, neuropsychological testing)

Sometimes function can be ascribed to the anatomic tests but often it cannot. The mental changes of a lightning survivor are functional (how the brain works) changes, not anatomic ones so that anatomic tests such as the CT scan and MRI are usually normal. More functional scans such as PET and SPECT may show changes but are hard to obtain due to their relative infrequency in medical centers. To use an analogy: if an electric shock were sent through a computer, the outside case would probably look ok (similar to a photo or x-rays of the person), the computer boards on the inside would probably look ok and not be fused nor melted (CT, MRI for the person), but when you boot up the computer it would have difficulty accessing files, making calculations, printing, etc. This situation is similar to a person with brain injury who has short term memory problems, difficulty accessing and coding information, difficulty organizing output, etc.

A functional test of how a person's brain is working that is seldom thought of by most non-neurologists is called neurocognitive or neuropsychological testing. These tests are administered by a qualified neuropsychologist familiar with the literature in this area, not by a psychiatrist, and consist of a 6-8 hour battery of pen and paper tests including memory, IQ, organizational

ability, and other how the parts of the brain are working' kinds of tests. Survivors of lightning and electrical injury usually have a characteristic pattern of deficits.

## **Delayed Problems**

Another common, but often delayed, problem for some survivors is pain, also a difficult problem to quantify and manage. The pain may not be from chronic intense headaches but may be in the back (perhaps from compression and disc injury from the intense muscle contractions which may throw a person several yards at the time of the injury), or in an extremity. Some may have nerve entrapment syndromes and a small number may eventually develop Sympathetically Mediated Pain Syndrome.

## **Sometimes the Right Rest Is Not Available**

Sometimes the functional tests that are ordered are testing the wrong thing; an electromyogram (EMG) measures only the largest nerve fibers, the motor fibers, which are seldom affected by lightning injury. Smaller pain carrying nerve fibers are not tested by EMG, so that a normal EMG means little when ordered for someone with pain. Likewise, the standard EEG measures primarily surface readings of the brain and misses seizure activity in several deeper regions.

Decreased libido and impotence are often reported.

## **Help Exists - Lightning Strike and Electric Shock Survivors, International, Support Group**

An organization that has been of tremendous help to survivors, their families, their physicians and other professionals is Lightning Strike and Electric Shock Survivors, International (LSESSI), a support group formed in 1989 by a gentleman who was injured in 1969 who became tired of no one recognizing or knowing what to do for those with lightning injury. LSESSI has printed materials, offers tremendous support, networks survivors with others in their area, and provides an annual meeting where survivors come together for support as well as for lectures from professionals who work with lightning and electrical survivors and their families.

LSESSI can be reached at 910-346-4708,

Lightnin@nternet.net,

<http://www.lightning-strike.org/index.html>,

or at P.O. Box 1156, Jacksonville, North Carolina 28541-1156.

## **Four Factors Necessary for Recovery**

The four most important factors in overcoming disability from lightning injury (or from any illness or major injury for that matter) are:

1. A supportive family / friends network.
2. The person or family becoming their own best advocate and learning as much as they can about their disability.
3. A physician (regardless of specialty) who is willing to listen, read, learn and work with the survivor and their family.
4. A sense of humor.

## **Prevention**

Far more important than treating survivors is preventing lightning injury. All of the people who have worked on this first National Lightning Safety Awareness Week have as their greatest hope that it will have helped you and your family learn how to avoid injury. Prevention is the KEY.

This fact sheet courtesy Dr. Mary Ann Cooper - Associate Professor, Departments of Emergency Medicine and Bioengineering University of Illinois at Chicago.