

# Intense Activity, Emotion Can Spur Aortic Rupture

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VANCOUVER, B.C. — At the moment acute aortic dissection occurs, two-thirds of affected patients are engaged in extreme physical exertion or have just experienced profound emotional distress, John A. Elefteriades, M.D., reported at a meeting sponsored by the International Academy of Cardiology.

This new observation—based upon his interviews with 90 survivors of this often calamitous event—has major clinical implications.

“Obviously we can’t eliminate physical activity and emotional stress from our lives. But I do believe there is one thing we can do: Before young people embark on programs of weight lifting and other forms of extreme physical exertion—and I say this as a big proponent of weight lifting, I’ve been involved with it all my life—I think what we can do to prevent these tragedies is to insist that an echo exam be done. If the aorta is not enlarged, the wall tension created by this activity just can’t become sufficient to dissect the aorta,” explained Dr. Elefteriades, professor and chief of cardiothoracic surgery at Yale University, New Haven.

In a series of 175 patients admitted to Yale with acute aortic dissection, 90 later consented to detailed interviews regarding the surrounding circumstances. Thirty-nine others had died, and the rest were lost to follow-up or unwilling to talk.

Of the 90 survivors who were interviewed, 18 (20%) knew of others in their family who had had an aortic aneurysm or dissection. In a separate, larger series of several hundred family pedigrees of acute aortic aneurysm patients traced by Dr. Elefteriades and coworkers, 21% had a positive family history, in most cases exhibiting an autosomal dominant pattern.

The most striking finding to emerge from the interviews with the 90 survivors was that 24 recalled being engaged in intense physical activity—serious weight lifting, picking up a granite commode, lifting heavy machinery, shoveling snow, and the like—at the instant dissection occurred, while another 36 were experiencing extreme emotional distress. Examples included suffering big losses at a casino or attending a business lunch that was a fiasco. One woman experienced her aortic dissection at the moment she learned she had been diagnosed with lung cancer.

Dr. Elefteriades was inspired to pursue this line of inquiry as a result of an observation he made several years ago, when in a short time period three previously healthy young men presented at Yale with acute aortic dissection. All three were serious weight lifters—and all were pumping iron when their aortic tears occurred. Other physicians have brought similar cases to his attention since he published this brief initial observation (JAMA 2003;290:2803).

He now has complete medical records on 29 cases of acute aortic dissection in weight lifters. He plans to publish the series soon. Once that occurs, he is optimistic that a preparticipation echocardiographic exam will become standard before people take up weight lifting, es-

pecially if they have a family history of aortic disease.

“All 29 were type A dissections. I think it’s the most proximal part of the aorta that’s vulnerable to dissection from physical exertion,” he said.

But although great physical stress or emotional bad news is the typical proximate cause of acute aortic dissection, they are hardly sufficient in and of themselves. Otherwise dissections would be a daily occurrence in gyms throughout the world. The key risk factors appear to be a genetic susceptibility to aortic dilation, along with blood pressures above 200 mm Hg. (See box.)

Dr. Elefteriades and coworkers are conducting a study with Celera Genomics scrutinizing 30,000 genes in each of roughly 500 aortic aneurysm patients and 500 controls. Although the final results, along with those of an ongoing European replication study, will not be in until later this fall, the preliminary findings from the first 100 patients are that mutations in five genes underlie the predisposition to have an aortic aneurysm.

“We feel very strongly that most if not all thoracic aneurysms and dissections are genetic,” he said.

In response to a question from the audience, Dr. Elefteriades said he has never been able to identify a reliable syndrome of premonitory symptoms of aortic dissection.

“I wish there was one. I think the fact that there’s not makes predictive and preventive efforts more relevant,” the surgeon said. “When we create acute dissections in the lab, I can tell you they happen instantaneously. One instant they’re not there, and the next instant they’ve gone all the way down to the iliac arteries.”

The noninvasive blood pressure monitor device developed for use in the gym by his anesthesiologist colleague has attracted commercial interest. Before long, this could be a means for individuals who insist upon engaging in power exercise—despite having been identified as being at elevated risk for aortic dissection by means of family history, a genetic test, and a positive echo exam—to keep their exertion below the critical level.

Session cochair Jeffrey S. Borer, M.D., the Gladys and Roland Harriman Professor of Cardiovascular Medicine, professor of radiology and of cardiothoracic surgery, and chief of the division of cardiovascular pathophysiology at Cornell University, New York, praised Dr. Elefteriades for providing “extraordinarily insightful data with enormous clinical implications.”



Out of 90 survivors of aortic dissection, 24 were engaged in intense physical activity at the instant dissection occurred.

## The Mechanics of Aortic Dissection

Dr. Elefteriades described the sequence of events that results in acute aortic dissection, based on the work that he and his colleagues have done.

First, a genetic predisposition to aneurysm formation leads over the course of many years to aortic dilation. When this reaches a critical point—the mean aortic diameter in the 90-patient series was 5.56 cm—an extreme physical or emotional trigger boosts systemic blood pressure to a level beyond the mechanical capacity of the thinned and weakened aorta.

“That’s why the dissection occurs at a particular instant,” the surgeon said.

A colleague has developed an apparatus for noninvasive measurement of blood pressure from moment to mo-

ment. Applying it during a weight-lifting workout, Dr. Elefteriades found that his systolic pressure climbed from a baseline of 130 to 270 mm Hg while he bench pressed his own weight. Another physician’s blood pressure jumped to 320 mm Hg.

“I never see blood pressures like that in the ICU taking care of ill people,” he observed.

Olympic-caliber weight lifters, he subsequently determined, raise their blood pressure as high as 380 mm Hg while lifting barbells. In mechanical studies, Dr. Elefteriades found that the tensile strength of an enlarged aortic wall—that is, its rupture point—is about 800 kilopascals. That’s exceeded when blood pressure in an enlarged and weakened aorta exceeds about 200 mm Hg.

# Aerobic Fitness Decreases Mortality in Hypertensive Women

BY MICHELE G. SULLIVAN  
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NASHVILLE, TENN. — Higher cardiorespiratory fitness is associated with lower all-cause mortality in hypertensive women, Carolyn E. Barlow said in a poster presented at the annual meeting of the American College of Sports Medicine.

Ms. Barlow, director of data management at the Cooper Institute, Dallas, presented the results of an open cohort study of almost 13,000 women who were fol-

lowed for up to 26 years. The women were part of the Cooper Aerobics Center Longitudinal Study, a prospective observational study of lifestyle and health.

All the women who participated in the study were examined at the Cooper Aerobics Center in Dallas from 1971 to 1998, and they were followed up yearly for mortality.

At baseline, the women received a comprehensive medical examination and exercise prescription. They also took a treadmill test, which was used to determine

their fitness level. The lowest 20% in each age group were considered “unfit,” while the upper 80% in each age group were considered “fit.” At baseline, their average age was 43 years. Of the cohort, 51% were normotensive, 31% were prehypertensive (120/80 mm Hg), and 18% were hypertensive (140/90 mm Hg or higher).

There were 298 deaths during the study period. After adjustment for age, exam year, and smoking, a trend toward lower mortality risk was seen in fit women, compared with unfit women in each blood

pressure group, but only in the hypertensive group was the difference statistically significant. Fit hypertensive women were 54% less likely to die than unfit hypertensive women.

The decreased risk of death was 19% for normotensive fit women, compared with unfit ones, and 5% for prehypertensive fit women, compared with those who were unfit.

“We have shown a similarly decreased risk for hypertensive men,” Ms. Barlow added.