Mental Stress and Heart Rhythm Disorders: Understanding the Mind-Body Connection

Rachel Lampert, MD
Yale University School of Medicine
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There is no conflict of interest with the subject of today’s talk
Woman Dies After Police Mistakenly Raid Her Apartment

By WILLIAM K. RASHBAUM

A 57-year-old Harlem woman preparing to leave for her longtime city government job died of a heart attack yesterday morning after police officers broke down her door and threw a concussion grenade into her apartment, the New York City police commissioner said. They were acting on what appeared to be bad information about guns and drugs in the apartment.

Commissioner Raymond W. Kelly apologized to the family of the woman, Alberta Spruill, and said he had suspended the use of the grenades, which are meant to stun and disorient people with a loud noise and a flash. He said that he had reassigned the lieutenant who made the decision to use the grenade to administrative duties, pending an investigation, and that he would review how the grenades were used and search warrants carried out.

Mr. Kelly said that the officers were executing what is known as a no-knock search warrant based on information provided by a drug dealer, who told the police that his supplier stored guns and drugs in Apartment 6F at 310 West 143rd Street. The dealer had told the police that he had seen armed people in the apartment on three occasions and that there was a pit bull inside, Mr. Kelly said. But in the raid at 6:10 a.m., the officers found only Ms. Spruill, and realized the information was wrong.

In the minutes after the grenade explosion, the terrified Ms. Spruill, who was dressed for work, was briefly handcuffed, but a police captain quickly realized the apartment’s layout was quite different from the one described by the dealer, and she was released, Mr. Kelly said. Ms. Spruill initially declined medical attention, although she told a police supervisor that she had a heart condition. An ambulance was requested, and she went into cardiac arrest on the way to Harlem Hospital Center, where she died at 7:50 a.m.

Ms. Spruill was a city employee for 29 years. Her job at the Division of Citywide Administrative Services included maintaining lists of candidates for civil service jobs, including police officers. Mayor Michael R. Bloomberg said that what had happened was tragic and called it “a terrible episode,” and said in a statement that he joined all city employees in grieving for Mr. Spruill.

Neighbors, family members and several elected officials questioned the department’s tactics, calling Ms. Spruill hardworking and devout and saying she had minded her own business. “Obviously it’s a mistake with the slipshod police work,” said State Assemblyman Keith Wright, who added, “I’m sorry to say, but these things happen all too often in this neighborhood.”

At a news conference seven hours after Ms. Spruill’s death, Mr. Kelly said it did not appear that the drug dealer had given previous information to the department, though he was registered as a confidential informant. The commissioner also said it was unclear whether the officers were actually in the raid, who were from the 25th...

Continued on Page B3
“Direct events often precipitated the disease; the infarct began in one case on climbing a high staircase, in another during an unpleasant conversation, and in a third, during emotional distress associated with a heated card game”

A quote from the early description of MI published by Obraztsov and Strazhesko in 1910.

Coronary occlusion takes place irrespective of the physical activity performed or the type of rest taken.

A quote from a study of the role of effort in precipitating MI published by Master in 1960.
33 Die, Many Hurt in 6.6 Quake
L.A. Area Freeways Buckle, Buildings Topple

Sylmar Jolted by Ghosts of Horror Past

 Disaster: Ensenada is in Northridge, where threecorner apartment complex pancaked. Ruptured gas lines erupted in life in strongest tremor in city's modern history.

History: The city that crumpled under a 6.5 quake in 1971, remembers well the terror that came when the earth gave way. On Monday, it seemed like it was cursed.

By Craig Turner
and Richard E. Meyer
Times Staff Writers

Debra House had nearly completed her 4 a.m. shower when the earthquake hit. She remembers the bed shuddering, the lights flickering, the sound of the TV news programs as if the earth gave way. It was, in fact, the worst earthquake in California history.

The 6.6-magnitude earthquake hit at 4:31 a.m. on Monday, causing widespread destruction across the Los Angeles area. The shaking was felt as far away as Phoenix, Arizona, and Las Vegas, Nevada.

The earth tremors were so strong that buildings collapsed, freeways buckled, and power lines snapped. In Northridge, a threecorner apartment complex pancaked, killing at least 33 people and injuring hundreds more. Ruptured gas lines erupted, causing fires and forcing thousands of people to evacuate their homes.

The earthquake was the strongest to hit the Los Angeles area in modern history, and it set off a chain of events that would leave the region in a state of chaos for months.

Thrust Faults Pose Brutal Danger to Basin

Commuters Will Face Nightmare for Months

Transportation: Several freeway sections are shut. Golden State, Santa Monica routes are heavily damaged.

Questions on Reinforcing of Freeways Raised
Northridge Earthquake: Atherosclerotic Deaths

Northridge Earthquake: Atherosclerosis-related sudden death

Population Stressors and Cardiovascular Morbidity and Mortality

- Athens Earthquake, 1981
  - Lancet 1983
  - Cardiovascular death

- Hanshin-Awaji Earthquake, J Thromb Haemostasis 1995
  - Cardiovascular and sudden death

- Iraqui Missile War (Israel)
  - JAMA 1995
  - Lancet 1991
  - Cardiovascular death
  - Acute MI, sudden death

- Croatia (Zagreb air raids)
  - Lancet 1992
  - Acute MI, cardiovascular death

- World Cup Soccer—England loses to Argentina
  - BMJ 2002
  - Acute MI
Circadian Variation of Sudden Cardiac Death and Non-Fatal Infarction

from Muller, et al, Circulation 1987
Circadian Variation of Ventricular Tachycardia

From Lampert, Rosenfeld, Batsford, Lee, McPherson, Circulation 1996
Circadian Variation of Ventricular Tachycardia in a Single Patient

From Lampert, Rosenfeld, Batsford, Lee, McPherson, Circulation 1996
Weekly distribution of ICD shocks
from Peters, Circ 1996

ICD Shocks
683 patients working

Sun Mon Tues Weds Thurs Fri Sat
0 200 400 600 800 1000 1200
Emotional and Physical Precipitants of Ventricular Arrhythmias

From Lampert, Joska, Burg, Batsford, McPherson, Jain, Circulation 2002

Complete the form, tear along perforation, seal, and mail.

Name: 
Date of ICD shock: 
Age: 
Yr, M, F, Unit #: 
Home Phone #: 
Pts Initials #: 
Pts Study #: 
Time: 
AM/PM Episode after enrollment (circle one): 
1 2 3 4 5 6 7 8 9 10

Please provide the following information at the time of ICD discharge and within previous 15 minutes. (Circle the most appropriate answer):

1. Location: Home, Work, Other (specify): 
2. Position: Standing, Sitting, Lying, Other (specify): 
3. Level of physical activity: 
   1. NONE 
   2. GREAT AMOUNT
   3. GREAT AMOUNT
4. Level of mental effort: 
   1. NONE 
   2. GREAT AMOUNT
   3. GREAT AMOUNT

Any recent change in your usual level of health (e.g., surgery, hospitalization, change in medications).

Other: 

It was please specifically during: urinary tract infection / diarrhea / fever / chest infection / other (specify).

What were you doing before ICD discharge? (Check all that apply): 

- Mood: 
  1. Happy
  2. Neutral
  3. Angry/Irritated
  4. Worried
  5. Stressed
  6. Scared
  7. Depressed
  8. Interested
  9. Bored
  10. Others

- Other activities: 
  - Drinking alcohol
  - Taking medication
  - Driving
  - Using toilet
  - Shopping
  - Exercising
  - Sexual activity
  - Reading
  - Talking on phone
  - Television
  - Working
  - Talking
  - Fighting/arguing
  - Gambling
  - Drinking coffee
  - Smoking
  - Working
  - Walking
  - Others

- Mood: 
  1. Happy
  2. Neutral
  3. Angry/Irritated
  4. Worried
  5. Stressed
  6. Scared
  7. Depressed
  8. Interested
  9. Bored
  10. Others

On the other side, please give a brief description of what was occurring with the symptoms and your thought process at the time. (Circle any possible factor which you think may have produced the heart rhythm resulting in ICD shock: 

- Mood: 
  1. Happy
  2. Neutral
  3. Angry/Irritated
  4. Worried
  5. Stressed
  6. Scared
  7. Depressed
  8. Interested
  9. Bored
  10. Others

- Other activities: 
  - Drinking alcohol
  - Taking medication
  - Driving
  - Using toilet
  - Shopping
  - Exercising
  - Sexual activity
  - Reading
  - Talking on phone
  - Television
  - Working
  - Talking
  - Fighting/arguing
  - Gambling
  - Drinking coffee
  - Smoking
  - Working
  - Walking
  - Others
Anger Level: Pre-shock versus control periods

From Lampert, Joska, Burg, Batsford, McPherson, Jain, Circulation 2002
Electrophysiological Characteristics of Anger-Triggered Arrhythmias

Stopper, Jain, Burg, Joska, McPherson, Batsford, Lampert; Heart Rhythm, 4:268-273
Non-anger-triggered arrhythmia, sudden onset

Anger-triggered, PVC-initiated

Stopper, Jain, Burg, Joska, McPherson, Batsford, Lampert; Heart Rhythm, 4:268-273
Anger-triggered, polymorphic, pause-associated arrhythmia

Stopper, Jain, Burg, Joska, McPherson, Batsford, Lampert; Heart Rhythm, 4:268-273
Appropriate ICD Therapies following 9/11/01

From Steinberg, et al, JACC 2004
Electrocardiographic repolarization during stress from awakening on alarm call

From Toivonen, et al, JACC, 1997
Adaptation of the QT Interval to HR: Arousal vs Rest

From Toivonen, et al, JACC, 1997
Repolarization changes with mental stress

From Lampert, Shusterman Burg, Lee, Earley, Goldberg, McPherson, Batsford, Soufer, J Cardiovasc Electrophysiology, 2005
Increase in TWA with stress based on catecholamine response to stress

From Lampert, Shusterman Burg, Lee, Earley, Goldberg, McPherson, Batsford, Soufer, J Cardiovasc Electrophysiology, 2005
Predictive value of anger-induced TWA

From Lampert, Shusterman, Burg, McPherson, Batsford, Goldberg, Soufer, JACC, 3/09
Anger-induced TWA and arrhythmia recurrence (cont)

Figure 2: Event-Free Survival
Kaplan-Meier survival curves depicting survival free from implantable cardioverter-defibrillator-treated ventricular arrhythmias in patients with anger-induced T-wave alternans (TWA) in the top quartile compared with the lower quartiles.
Effects of Stress on Arrhythmia Induction in Dogs

Changes in Induced Arrhythmias During Mental Stress: Protocol

Patient Preparation:
- IV insertion
- VEST positioned
- ECG, R-2 pads

Baseline
- Programmed stimulation
- Ventricular Arrhythmia

Mental Arithmetic
- Programmed stimulation
- Ventricular Arrhythmia

Anger Recall
- Programmed stimulation
- Ventricular Arrhythmia

Time:
- 30’
- 7-15’
- 3’
- 7-15’
- 3’

BP, HR, ECG

catecholamines

From Lampert, Jain, Burg, Batsford, McPherson, Circulation 2000
Change in Tachycardia Inducibility With Mental Stress

BEGINNING OF PROTOCOL

BASELINE

CL 500 + 1 PES
CL 400 + 1 PES
CL 500 + 2 PES
CL 400 + 2 PES
CL 500 + 3 PES
CL 400 + 3 PES
“long-short” + 1 PES
“long-short” + 2 PES
Non-inducible

MENTAL STRESS

End of Protocol

“long-short” + 1 PES
Alteration of VT CL by anger
Change in Termination of Induced Arrhythmias With Mental Stress

BASELINE

ATP acceleration (into next zone)
ATP failure (shock within zone)
ATP success
Self-terminating

MENTAL STRESS

From Lampert, Jain, Burg, Batsford, McPherson, Circulation 2000
Alteration of VT termination by anger

[ECG tracings showing time stamps and annotations]

YNHH Electrophysiology Laboratory, Yale University School of Medicine
Emotional Stress

Increased Catecholamines → Heterogeneity Of Repolarization → Polymorphic Ventricular Tachycardia

Sudden Death
Stress is bad....
Does this mean I better not go to the in-laws for the holidays?
Changes in Ventricular Tachycardia with Mental Stress: Pigs
form Kirby, Am J Physiol 1991

Increased Ease of Induction With stress

Tachycardia Rate (bpm)

percent

control
beta-blocked

baseline
stress
Effects of atenolol and metoprolol on stress-induced changes in heart-rate variability

From Tuininga, et al, Circulation 1995

Baseline (open bars)
200 mg metoprolol CR (shaded bars)
100 mg atenolol (filled bars)
Psychological Intervention after ICD Implantation

From Kohn, PACE 2000
Psychological Intervention and Shocks

From Chevalier, Am Heart J, 2006
The RISTA Trial

Stress reduction has long been a part of prevention for patients with heart disease. Stress reduction can improve the patient’s medical outcomes and quality of life. The doctors and staff on the RISTA team are working to learn if a stress reduction program for new ICD patients can: 1) reduce abnormal heart rhythms that can cause an ICD shock and 2) improve quality of life.

The Sponsors

The National Heart, Lung & Blood Institute of the National Institute of Health is funding the RISTA Trial

The RISTA Trial is approved by Yale Human Investigations Committee

HIC# 0708003000

The RISTA Team

Matthew Burg, Ph.D., Principal Investigator
Rachel Lampert, M.D., Co-investigator
Rebecca Donahue, Ph.D., Intervention Coordinator
Sandra Ginter, R.N., Project Coordinator

The doctors and staff on the RISTA team are working to learn if a stress reduction program can: 1) reduce the chance that a new ICD patient will have abnormal heart rhythms that can cause an ICD shock and 2) improve quality of life.

If you have questions or are interested in participating please call us at: 203-737-1800.

The RISTA Trial

Yale University School of Medicine Program on Aging
300 George St., Ste. 775
New Haven, CT 06511

Phone: 203-737-1800
Toll Free: 1-800-619-0132

Reducing ICD Shock Treated Arrhythmias

A Stress Reduction Program for New ICD Patients

Supported by National Institutes of Health, National Heart, Lung, & Blood Institute

Yale HIC # 0708003000
What patients have to say...

"Participating in the study was easier than I thought it would be."

"I really enjoyed being in this study, the research staff were very accommodating to my scheduling needs.

I felt that it was important to donate my time to this study, in order to help others who may someday be in a similar position.

Special Note to Women:

Much of what we know about heart disease and its treatments is based on studies involving mostly men. It is important that women participate in these studies so we may understand how heart disease works as well as which therapies are most successful in women and men. We hope that you will consider participating in the RISTA Trial.

"We hope you’ll consider participating in RISTA, it’s an important part of our on-going efforts to improve outcomes for ICD patients."

Dr. William Batsford, M.D.
Chief of Electrophysiology,
Yale School of Medicine

Study Specifics

Participants in the RISTA trial will be followed for two (2) years. Participants randomized to the 'treatment' group will attend 8 sessions as a small group, either in person or over the telephone.

Each participant will complete two lab sessions that run approximately 1 ½ hours – First session upon enrollment and the 2nd sessions approximately 4-5 months later.

There is a 24 hour heart monitor session following the lab sessions which are scheduled at your convenience in your home.

Study Compensation

The study will compensate participants for their time and effort as well as cover any parking and postage expenses. Participants may receive up to $750.00

$200 per lab session
$100 per monitor/diary session
$50 per follow-up
“Reducing Vulnerability to ICD Shock Treated Ventricular Arrhythmias”

Randomized clinical trial of the effects of a stress reduction intervention (SRT) on the prevalence of shock-treated ventricular arrhythmia among new patients with ICD.

1) SRT will be associated with reduced relative risk of ventricular arrhythmias requiring shock for termination;

2) SRT will be associated with a decrease in arrhythmogenic electrophysiological changes (T-wave alternans) seen in response to acute stress in the laboratory;

3) SRT will be associated with better QOL after ICD implantation.
“Complementary” Therapies: Reiki

- Reiki – light touch therapy and spiritual healing practice
- Promotes relaxation
- Reduces anxiety, perceived stress, pain severity (Wardell et al, 2001)
- Preliminary studies show autonomic effects (Mackay, 2004)
- Increased use in hospital setting
  - YNHH Reiki Volunteer Program
- Limited rigorous clinical research examining physiologic changes

Slide courtesy Rachel Freidman
Effects of Reiki on autonomic activity early after acute coronary syndrome

Randomization

Eligible Patients Admitted to CCU/5-2/5-3
Inclusion Criteria: ACS within 72 hrs
Exclusion Criteria: A-fib, paced rhythm, symp/psych drugs, unable to give consent

Rest n= 23 [Passive Control]
Minimal Distraction Environ
Supine, TV off, lights off, no visitors, door closed, DND sign

Music n = 23 [Active Control]
MDE
Music via Headphones
Slow tempo classical or new age

Reiki n = 23 [Intervention]
MDE
Reiki Treatment
Standardized 7 Positions

Slide courtesy Rachel Freidman
Figure 2  Effect of Intervention on Emotion

Values represent change in the level of emotion as measured by a Likert scale from baseline to intervention.

Freidman, Burg, Miles, Lee, Lampert, J Am Coll Cardiol, 2010:56:995-6
Figure 1: Impact of Interventions on Heart Rate Variability and R-R Interval

Bars represent change in high-frequency (HF) heart rate variability and R-R interval with each intervention.
Yoga For Internal Cardioverter Defibrillator Patients

by Stefanie C.F. Toise, MPH, PhD candidate

Preliminary Results: (as compared to usual care)

• Lowers shock anxiety
• Improves patient acceptance of device
• Lowers depression

and may reduce shock episode duration and/or frequency (currently under study)
Effect of Yoga on Arrhythmia Burden, Anxiety, Depression and Quality of Life in Paroxysmal Atrial Fibrillation: The ‘YOGA My Heart’ Study

Dhanunjaya Lakkireddy, MD, Donita Atkins, RN, Jayasree Pillarisetti, MD, Kay Ryschon, MS, Sudharani Bommana, M.Phil., Jeanne Drisko, MD, Subba Reddy Vanga, MBBS, MS, Buddhadeb Dawn, MD
Patients shocked at baseline

From Lampert, Jain, Burg, Batsford, McPherson, Circulation 2000