

DSED: Is It Real?



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“However beautiful the strategy, you should occasionally look at the results.”

-- Winston Churchill



The Plan

- A Brief Case Review
- Review of the Evidence (and the Anecdote)
- A Modest Proposal



Case #1

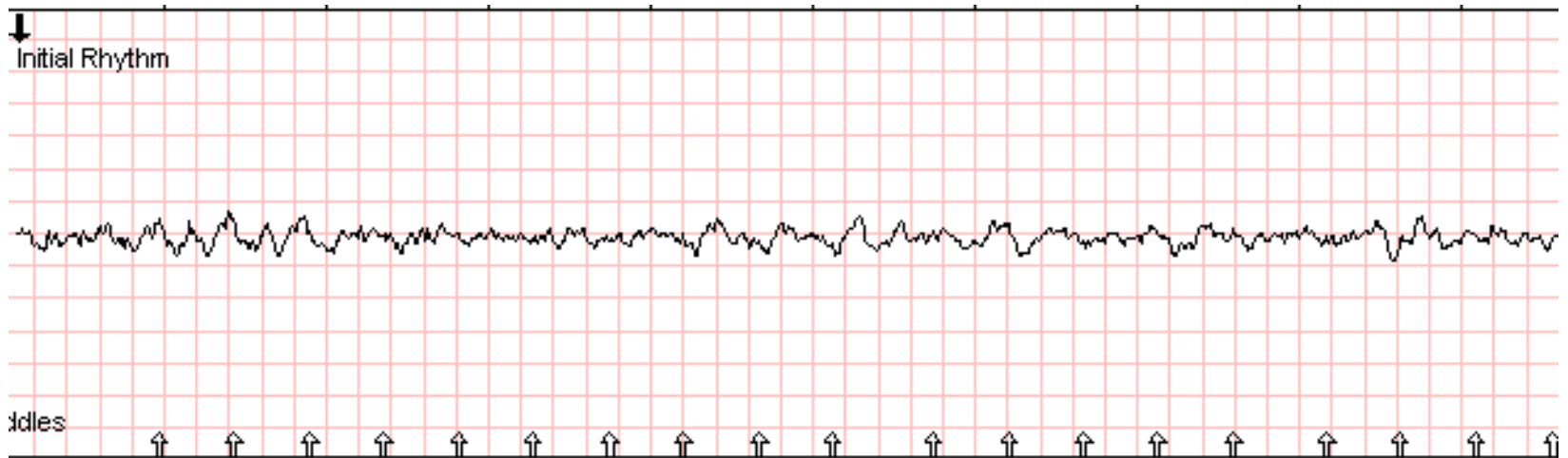
- ❑ 82 year-old male
- ❑ Pseudo-witnessed cardiac arrest in his home
- ❑ No bystander CPR but FR arrival in <6 mins



Case #1

- ❑ Firefighters begin uninterrupted compressions
- ❑ AED advised shock and one is delivered prior to EMS arrival

Case #1 Initial Rhythm

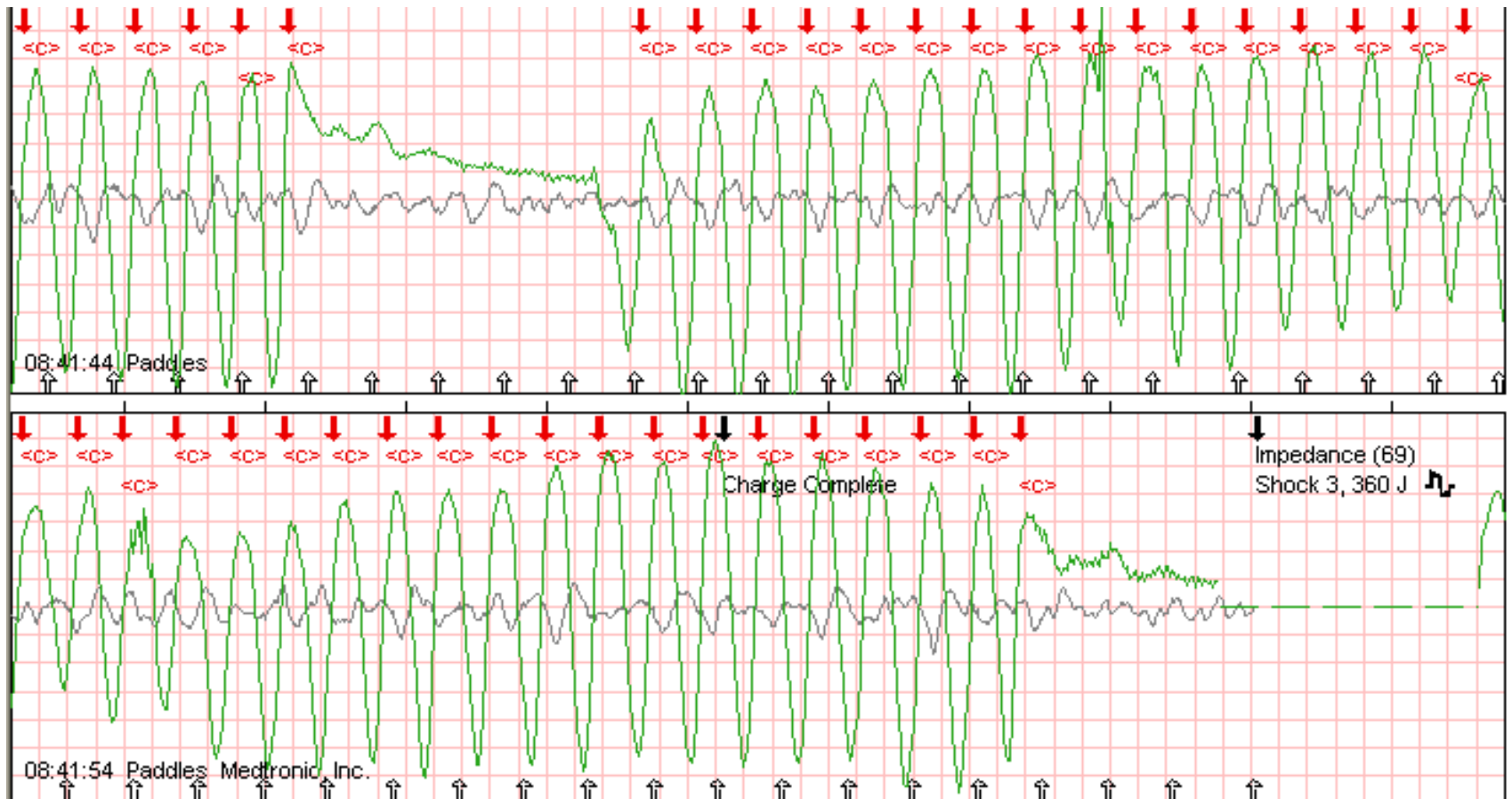


Case #1

- ❑ EMS arrives just as first defibrillation is being provided
- ❑ BVM EtCO₂ = 44 with good wave form
- ❑ IO is placed in tibia
- ❑ King Airway is placed
- ❑ Vasopressin and epinephrine are administered



Case #1 Third +10 mins



Case #1

- Bicarbonate, amiodarone, procainamide are administered
- Magnesium is also administered
- At ~ 25 minutes, EtCO₂ = 35



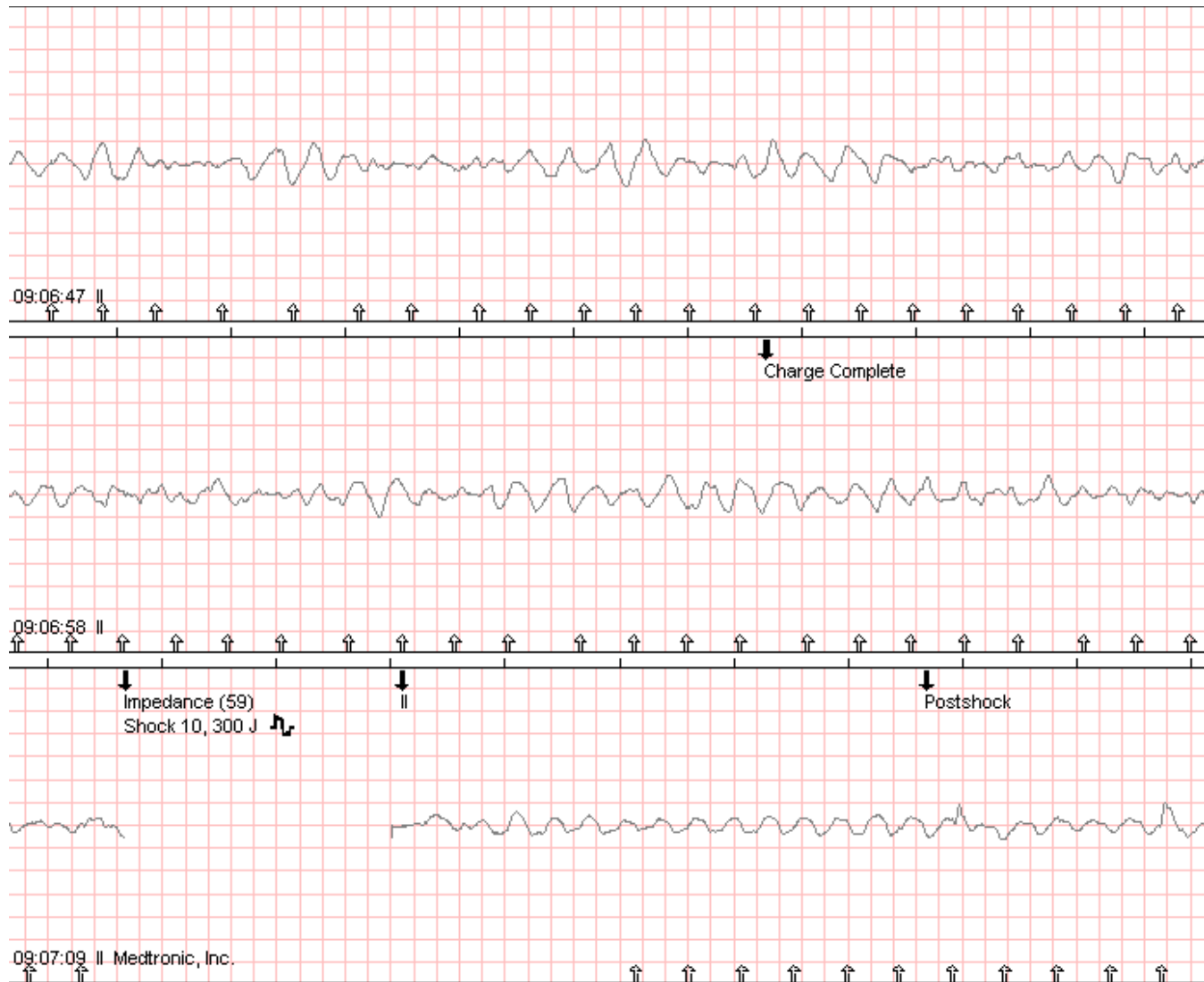
Case 1 Shock 7 +23 mins



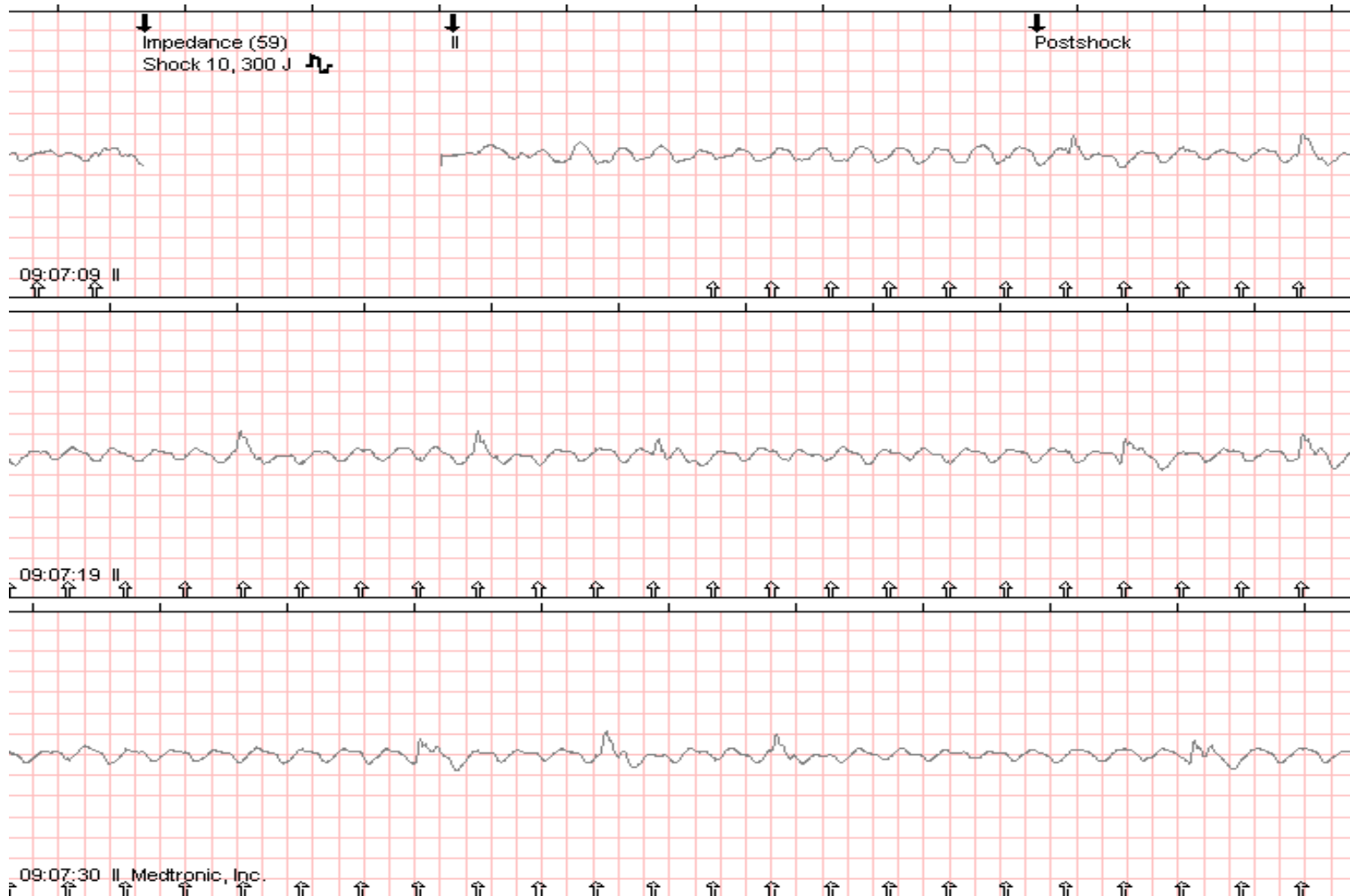
**Insanity: Doing the same thing
Over and over again and
Expecting different results**

-Albert Einstein

+36 mins First DSED



Case #1 DSED post-rhythm



Case #1 DSED #1 Monitor #2



DSED 5, Shock 15 +56 mins



End of the Story

- Patient arrives in emergency department with EtCO₂ of 50 and good wave form
- After additional resuscitative efforts in the emergency department, work is terminated



A Little Evidence

Observations:

- Refractory ventricular fibrillation is not new, particularly in the EP lab
- Refractory VF includes Persistent VF and Recurrent VF
- Current ACLS guidelines are superior to all previous ACLS guidelines
- The following discussion is “post-ACLS” and not “anti-ACLS”



There Are Five Things

- ❑ Electrical reversion at 200 wsec, 300 wsec, 360 wsec
- ❑ Intubation, hyperventilation, epinephrine
- ❑ Aggressive use of IV lidocaine with 360 wsec to follow
- ❑ Bretylium and magnesium IVP with 360 wsec to follow
- ❑ Repeat 360 wsec
 - ❑ Slovis and Wrenn, J Critical Illness, 1994

What About Persistent VF?

- ❑ Working hypothesis is that this is an electrical/mechanical problem
- ❑ Vectors, waveforms, and total energy each seem to play a role
- ❑ Not smart enough to talk about biphasic, reticular, etc.



What Evidence Do We Have?

□ Atrial fibrillation patients

- Propofol and up to 2 “standard” single monitor/defibrillator cardioversions were provided from April 1998 and January 2003
- 99 patients failed to cardiovert after these 2 standard cardioversions
- They were enrolled in the study



What Evidence Do We Have?

- These 99 patients underwent Double Sequential External Cardioversion with each Defibrillator charged to 360J
- 66 were cardioverted on the first double attempt
- 14 were cardioverted on the second double attempt
- 81% of the 99 were successfully cardioverted



What Evidence Do We Have?

- 12 month period to remain in NSR is similar between the “standard” and the “high energy” group
- No incidence of CHF, no significant burns, no other known complications in this study associated with higher-energy shocks
 - Alaeddini J et al. PACE 2005;28:3-7



Does Higher Energy Cause Myocardial Damage?

- Atrial fibrillation patients who failed traditional cardioversion were enrolled in the study and treated with the “quadruple pad approach”
- Measured success of cardioversion, post-treatment CK-MB and troponin
 - Marrouche NF PACE 2001;24:1321-24



Patients with chronic atrial fibrillation

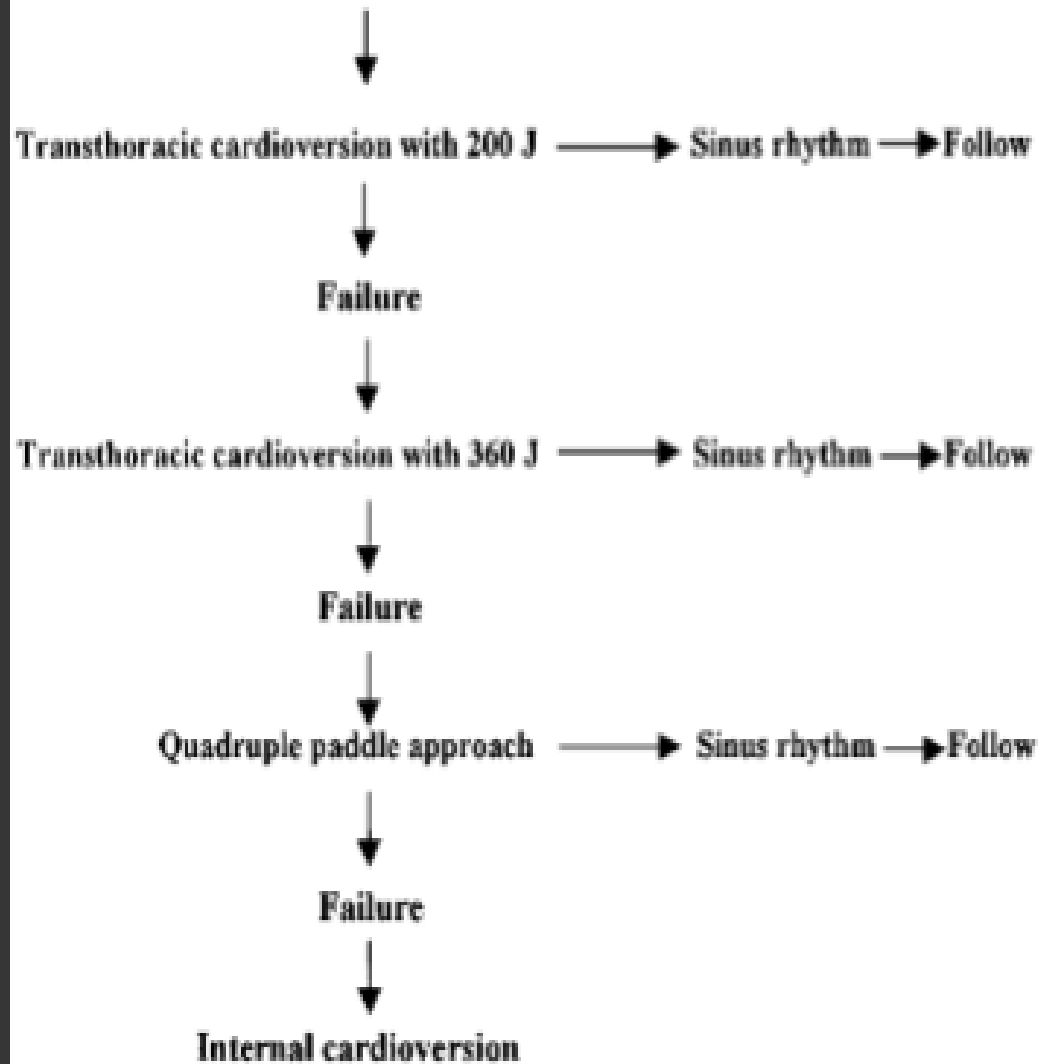


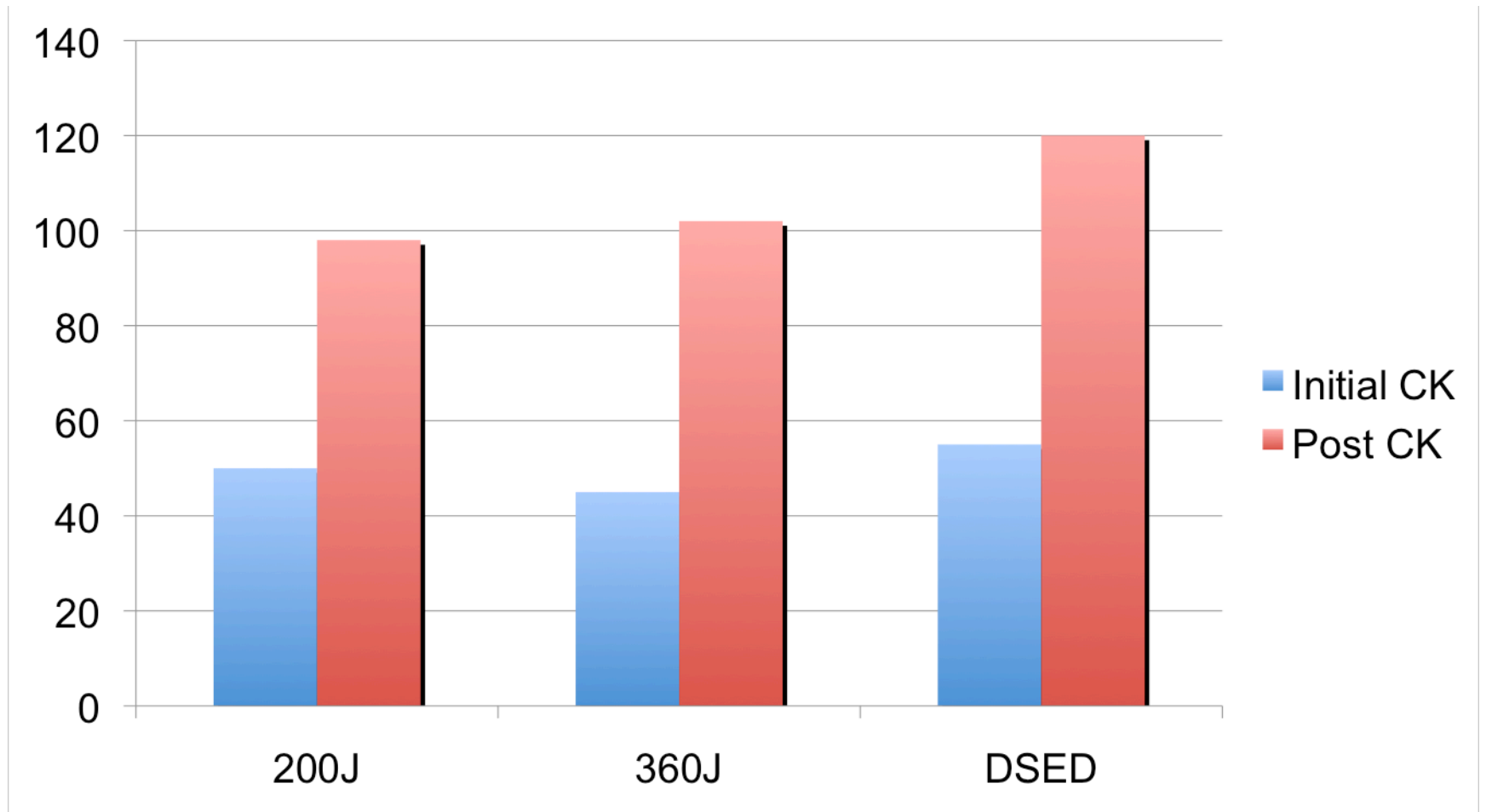
Figure 2. *Study protocol.*

Results

- ❑ 46 patients failed chemical cardioversion
- ❑ 27 of these were successfully cardioverted after 200J + 360J
- ❑ 19 then underwent DSEC
- ❑ 14 were successfully cardioverted
- ❑ 4 of the remaining 5 failed transvenous cardioversion



Results



Here It Is – The Big Study

- 1994 study by Hoch et al
- 2,990 consecutive patients in 3 year EP lab experience with 5,450 total EP studies
- Treatment described was applied to 5 total patients



What Did We Say About 5 Things?

- ❑ Pre-DSED attempts ranged from 7 to 20 attempts with single device
- ❑ VF, VT, WPW, and AF were dysrhythmias encountered
- ❑ EF ranged from 10 to 60%
- ❑ Range between defibrillations was 0.5 to 4.5 seconds

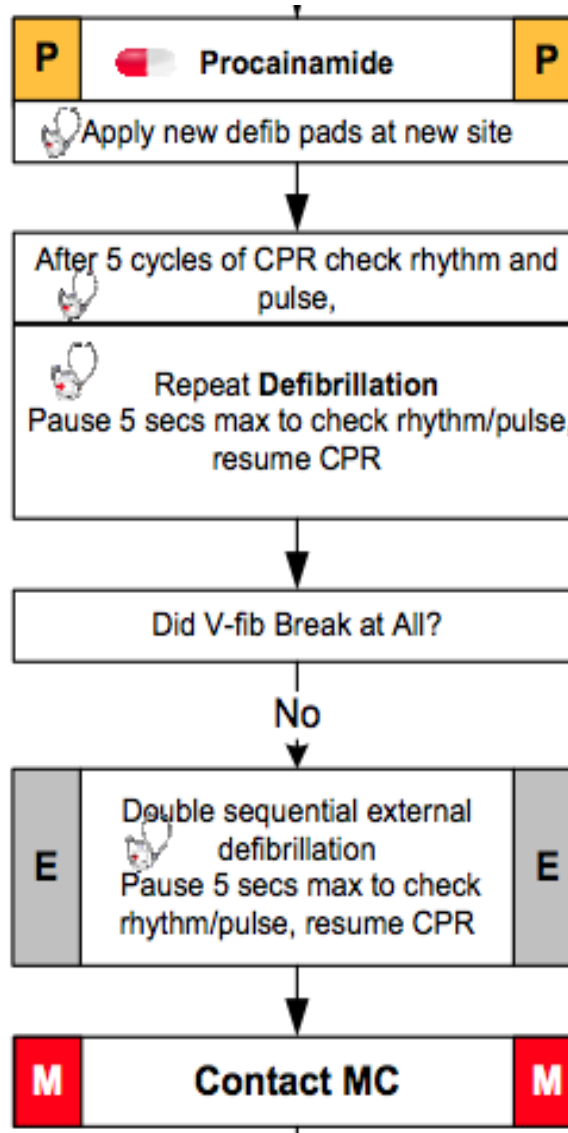


So What Happened?

- All five patients were successfully cardioverted on the first DSED
- “This finding, combined with its ease and limited morbidity, warrants further study of this approach”
 - Hoch et al. J Am Coll Cardiol 1994;23:1141-5



Persistent Pathway



So What?

- Clearly, the greatest proportion of survivors are successfully defibrillated early (1 or 2 shocks) – 50% of our survivors never have an airway at all
- Should we write off the rest?




What We're Gonna' Do

- ❑ Continue with proven compression, minimal ventilation, and hypothermia strategy
- ❑ Add aggressive treatment for those patients who experience “post-ACLS” ventricular fibrillation



Double Sequential External Defibrillation in Out-of-Hospital Refractory Ventricular Fibrillation: A Report of Ten Cases

José G. Cabañas , MD, MPH, J. Brent Myers , MD, MPH, Jefferson G. Williams , MD, MPH, Valerie J. De Maio , MD, MSc & Michael W Bachman , MHS, EMT-P

Pages 126-130 | Published online: 22 Sep 2014



Clinical Characteristics

TABLE 1. Clinical characteristics of cases with refractory ventricular fibrillation

Case	Age	Gender	Witnessed	First Response Time	AED Shocks	Bystander CPR	Initial Rhythm	Single Shocks	DSED Shocks	Time to First DSED
Case-1	82	M	Bystander	< 5 minutes	2	Yes	V-fib	9	3	30 minutes
Case-2	72	M	Bystander	< 5 minutes	2	Yes	V-fib	14	8	43 minutes
Case-3	20	M	No	< 5 minutes	None	No	Asystole	6	1	38 minutes
Case-4	76	M	Bystander	< 5 minutes	None	Yes	PEA	5	2	29 minutes
Case-5	23	M	No	5-10 minutes	None	Yes	Asystole	6	1	40 minutes
Case-6	77	F	Bystander	< 5 minutes	1	Yes	V-fib	4	1	32 minutes
Case-7	86	M	Bystander	< 5 minutes	None	No	Asystole	7	2	51 minutes
Case-8	82	M	No	< 5 minutes	1	No	V-fib	18	5	44 minutes
Case-9	83	M	Bystander	6 minutes	2	No	V-fib	6	2	39 minutes
Case-10	65	M	Bystander	< 5 minutes	None	Yes	V-fib	6	2	22 minutes

Results

TABLE 2. Clinical outcomes of cases with refractory ventricular fibrillation

Case	Terminated V-Fib	ROSC	Total Resuscitation Time	Field Termination	Transported	Survival
Case-1	Yes	Yes	45 minutes	No	Yes	No
Case-2	Yes	Yes	65 minutes	No	Yes	No
Case-3	Yes	No	50 minutes	Yes	N/A	N/A
Case-4	No	No	46 minutes	Yes	N/A	N/A
Case-5	Yes	No	45 minutes	Yes	N/A	N/A
Case-6	Yes	No	52 minutes	Yes	N/A	N/A
Case-7	Yes	No	60 minutes	Yes	N/A	N/A
Case-8	No	No	82 minutes	No	Yes	No
Case-9	No	No	62 minutes	Yes	N/A	N/A
Case-10	Yes	Yes	31 minutes	No	Yes	No





The Journal of Emergency Medicine

Volume 46, Issue 4, April 2014, Pages 472–474



Clinical Communications: Adults

Double Simultaneous Defibrillators for Refractory Ventricular Fibrillation

Benjamin W. Leacock, MD 





Journal of Cardiothoracic and Vascular Anesthesia

Volume 29, Issue 2, April 2015, Pages 421–424



Simultaneous Use of Two Defibrillators for the Conversion of Refractory Ventricular Fibrillation

Neal Stuart Gerstein, MD^{*}  , Mark Bipin Shah, MD[†], K. Michael Jorgensen, MD[†]




Research article

Double Sequential Defibrillation for Refractory Ventricular Fibrillation: A Case Report

Aurora M. Lybeck , MD, Hawnwan Philip Moy, MD & David K. Tan, MD

Pages 554-557 | Published online: 13 May 2015

 Download citation

 <http://dx.doi.org/10.3109/10903127.2015.1025155>

 Crossmark

PEC 2015, 19(4): 554-7



Summary

- ❑ Refractory ventricular fibrillation exists, both in the recurrent and persistent types
- ❑ Evidence supporting uses of DSED is Level III, Grade C
- ❑ Compassionate use is a consideration to act based on such limited evidence
- ❑ How many shocks before we try DSED?

