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Successful Automated External Defibrillator

Resuscitation of a Soldier

Electrocuted During Urban Military

Operations

By

Aaron Cronin P.A.-C. , 1LT, AMSC

Michael J. Sigmon M.D, LTC, MC

Summary

This report describes an uncommon case of electrocution in an urban combat environment and its successful treatment with an automatic external defibrillator (AED) by a battalion physician assistant and medics operating forward of other medical support. Cardiac activity was restored after two minutes of unsuccessful CPR with a single shock, and the soldier was able to return to full duty after 48 hours of observation at a Combat Support Hospital. Well trained, U.S. Army medics can manage the immediate respiratory problems associated with alternating current electrocution, and these types of injuries normally leave little sequelae if cardiac activity can be restored. Recent advances in automatic external defibrillator technology make it feasible to transport, maintain, and utilize AEDs to save lives as far forward of battalion aid stations, as this case illustrates.

Case Report

Soldiers of the 94th Engineer Combat Battalion (Heavy) were assigned to remove debris from a two-block neighborhood in the Thawra Section of Baghdad (formerly Saddam City) one

month after Operation Iraqi Freedom's major combat operations ceased in 2003. During the mission's first hour, a 25-year-old, male communications specialist was raising the OE 254 system to its height of 7.6 meters (see Photo 1).



Photo 1. OE 254 deployed.

As he lifted the onto its base, it fell into direct contact with a bare high voltage wire conducting 11,000 volts of alternating current (confirmed by U.S. Army Prime Power Engineers on site). The wire's transformer exploded and the soldier was electrocuted. The electrical surge cut through the where it contacted the overhead wire. Simultaneously, the current coursed down through the aluminum mast and melted its base. Without the overhead and base, the entire system fell away from the wire and freed the soldier from continuous electrical current (see photo 2).



Photo 2. Support Mast melted through on one side

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The patient let out two screams, collapsed, and lost consciousness. The battalion P.A. noted that the soldier was in respiratory arrest. A weak, thready pulse was palpated on initial assessment, but absent by the time the patient was positioned to begin rescue breathing. The P.A. initiated CPR and directed his medic to bring the AED from the nearby ambulance. Carotid and radial pulses remained absent after approximately two minutes of CPR. The AED electrodes were placed while CPR was continued and the machine correctly diagnosed movement. CPR was discontinued while the AED searched for and found a shockable rhythm and voiced "shock advised". A single electrical shock was delivered.

The AED diagnosed a normal rhythm and immediately voiced "no shock advised". The patient's pulse was palpated as strong and regular and his heart was auscultated as normal. Two cycles of rescue breaths were given before spontaneous respirations slowly began. The patient's respirations transitioned from irregular, deep gasps to normal breaths. Within fifteen minutes, he alert to person, place, and time and his blood pressure and pulse normalized within normal limits. At 30 minutes post-electrocution, the patient complained only of blurred vision and severe pain in his right hand and shoulder. He was noted to have burns on his right hand, (photo3) and right shoulder, (photo 4).



Photo 3 Direct contact burn

Photo 4 Burn from arc off the mast where mast was in soldier's hand

The latter burn was subsequently thought to be as a result of an electrical arc and not an exit wound (as would be seen with lightning). At this point, he was loaded onto a helicopter and air evacuated to the 28th Combat Support Hospital where he remained for 48 hours.

During his inpatient care, his electrocardiogram revealed normal sinus rhythm. His qualitative urinalysis was significant for protein and blood. His vision was assessed as normal. He was treated with Percocet for pain and released back to his P.A.'s care after his urinalysis showed significant normalization. Four days after the event, the patient noted bilateral flank pain and had some costovertebral tenderness. His urine dipstick showed minimal levels of protein, but no blood. Ten days after the incident, the soldier complained of soreness and linear erythema

where the AED electrodes were attached. His hand and shoulder burns were healing without infection. Three weeks after being electrocuted, his qualitative urinalysis was normal, his flank pain had resolved, and he was in good spirits and recovering on light duty without any significant sequelae. Six months later, he re-deployed to Germany with his battalion after successfully completing his combat tour.

Discussion

Electrocution from high voltage lines is the fifth leading cause of occupational deaths in the United States.(1) Low hanging power lines are common in Baghdad. Even more common is the process of "pirating electricity"; clandestine attaching of wires to high voltage wires and running them to homes and businesses. The communication specialist mistakenly erected the near a power line because he wished to remain within the protection of the clean up site's command post and needed to quickly establish communications for security and potential emergency medical evacuation. Future military operations in urban terrain will encounter similar environments throughout most of the developing world.

High voltage lines leading to houses generally carry alternating current, which causes tetanic contractions. Therefore, the subject is unable to let go of the contact object and remains in the electrical pathway. Here, the soldier was fortunate that the current severed the antenna, allowing it to fall away from the electrical source. Thoracic muscle tetany involving the diaphragm and intercostals muscles can cause respiratory arrest.(2) Alternating current is more cardiotoxic and the most common dysrhythmia it produces is ventricular fibrillation (3), but it does not cause the thermal damage of direct current injuries. If the patient can be successfully resuscitated, there is normally no permanent sequelae.(4) Appropriate post-resuscitative therapy in these cases includes a follow up electrocardiogram and laboratory confirmation that significant myoglobinuria did not occur, and this care was accomplished at the Combat Support hospital. AEDs have improved significantly since first being introduced by Diack et al in 1979.(5) Earlier units were bulky, expensive, and were difficult to use because of high energy levels and monophasic waveforms, which limited their acceptance.(6) Today's defibrillators take advantage of low-energy biphasic truncated exponential waveforms (standard in implantable cardioverter defibrillators), improved software, and improved lithium battery performance to provide low cost, light weight machines. Biphasic AEDs are able to analyze even fine ventricular fibrillation wave patterns correctly, and deliver a lower electrical charge based on the impedance of the subject so there is less risk of damage to

the heart. Modern AEDs require virtually no maintenance and can remain charged for years.(7) (8)

AEDs are not part of Army battalion aid station or ground ambulance medical equipment sets at this time. However, following this successful defibrillation and realizing the risk of future electrocutions in Baghdad, the 1st Armored Division purchased AEDs for its battalion aid stations during O.I.F. #2. Currently, the Army Medical Department Center and School is addressing the concept of training and issuing AEDs to Level 1 care providers.(9) This is being facilitated by the Integrated Concept Team (ICT) on Combat Casualty Care. Conclusion

Electrical hazards are common in the urban environments of the developing world and will continue to threaten soldiers. Electrocutation from high voltage equipment such as radio transmitters is also possible. A recent electrocution even occurred in the U.S. Army's infantry training program during routine training.(10) Well-trained medics can manage the immediate respiratory problems associated with alternating current electrocution, but only defibrillators will restore cardiac activity. This case demonstrates that AED technology has advanced to the point that electrical therapy can successfully be used forward of battalion aid stations.

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- (7) Varon, Joseph, et al. Automatic external defibrillators: lessons from the past, present and future. Resuscitation 3 August 1999 Volume 41, Issue p 219-223
- (8) The AED used in this case was a Medtronic Physio-

Control Lifepak 500, biphasic AED, with a Li 502 lithium battery, 12 volt, 7.5 amp/hr capacity

(9) Information on the AMEDD Center and School's Combat Casualty Care ICT and AEDs was provided via email correspondence with the Directorate of Combat & Doctrine Development on 16 November 2004.

(10) Soenarie, Angeliq. Soldier electrocuted during basic training. Columbus Ledger Enquirer homepage June 22, 2004 www.ledger-enquirer.com/mld/ledgerenquirer/news/state/8980065.htm(10) Soenarie, Angeliq. Soldier electrocuted during basic training. Columbus Ledger Enquirer homepage June 22, 2004 www.ledger-enquirer.com/mld/ledgerenquirer/news/state/8980065.htm

President of the 1st SAPA Board of Directors Retires

Submitted by Bonnie San Juan



L-R: Bonie San Juan, Oscar San Juan, COL Steven Hunte, Hospital Commander, USAMEDDAC, Ft Eustis, VA

Mr. San Juan is retiring with almost 40 years of federal service; 26 years on Active Duty and over 13 years as a civilian service employee. Some of his military accomplishments include: Graduating from the Army PA School in 1975, class 3. After graduation he was assigned to Ft. Hood, TX, as a PA serving under MG George S. Patton, Jr., 2nd Armored Division Commander. During the summer of 1976, Mr. San Juan was a member of a small group of Army PAs, stationed at Fort Hood, who saw the need for a civilian organization to represent the Army PA. By April 1977, the Society of Army Physician Assistant's (SAPA) was formed and he served as the President of the 1st SAPA Board of Directors. SAPA is a constituent chapter of the American Academy of Physician Assistants (AAPA). S.A.P.A. is a civilian organization designed to represent and support the U.S. Army Physician Assistant, including, Former, Active, Retired, Reserve and National Guard PA's. The Society's goals are to provide a forum for discussion, representation with the AAPA, and to provide high quality, low cost CME (continuing medical education) to the Society's members and the PA profession.

In 1980 he was selected to serve as the President to the Society of European Army Physician Assistant's and was PA

Consultant to two European MEDCOM Commanders: MG Floyd W. Baker, and MG Quinn H. Becker, who became the Army Surgeon General. From 1985 through 1988, he was the PA consultant to the Surgeon General while concurrently serving as the Department of the Army PA Career Manager. Working with fellow PAs, he researched and co-authored the legislative proposal which resulted in all PAs transitioning as commissioned officers in lieu of Warrant Officers. This act alone affected the career path of over 500 active duty PAs. During the period from 1988 through 1991, Mr. San Juan returned to clinical medicine as the senior PA at both Ft. Belvoir and Ft. Eustis MEDDAC's.

In 1992 he retired from Active Duty, was awarded the Legion of Merit, he entered Civil Service as a staff Physician Assistant, and was assigned to the Troop Medical Clinic. When the TMC closed in 1995, he was assigned to what is now known as the Family Health Clinic.

Mr. San Juan has served this country and McDonald Army Community Hospital both administratively and clinically in an unparalleled manner.

NEW IPAP Information for 2006!

Submitted by COL Sherry Morrey

Application Deadlines

The application deadline for the FY 2006 Interservice Physician Assistant Program (IPAP) Student Selection Board is 1 March 2006 !!. The only documents accepted after 1 March 2006 will be official transcripts (of courses in progress) and SAT scores. You may enroll in college courses during the Spring semester as long as the transcripts arrive at USAREC by 1 June 2006. Only transcripts for courses in progress may arrive after 1 March 2006. The board is anticipated to convene in mid-June. The board will be selecting students to attend IPAP classes that start January 2nd, April 30th and August 27th of 2007. Selectees will be required to report to Fort Sam Houston no later than 3 weeks prior to the class start date in order to participate in the week-long IPAP orientation and to complete in-processing. The results of the selection board will be released in mid-August and will announce the selectees for each of the 3 classes to be conducted in 2007.

New Minimum SAT Requirements

All applicants, regardless of degree status, must take the Scholastic Aptitude Test (SAT) within five years of the fiscal year of application. The minimum score must be 450 in each section of the exam and a composite score of no less than 1500 in the newer version and a minimum composite score of 1000 in the previous version.

This requirement for the SAT may not be substituted with another college aptitude exam, i.e. the GRE or the ACT.

The Requirements Completion Course

The Requirements Completion Course (RCC) provides soldiers, who are missing the anatomy, physiology, chemistry and math prerequisite courses and are therefore unable to meet all IPAP prerequisites, an opportunity to be reassigned to AMEDD Center and School, Fort Sam Houston, TX and obtain these prerequisite courses. Applicants who meet all academic and administrative eligibility criteria for IPAP application except for 15 or less semester hours (SH) can apply for consideration for enrollment in the RCC. Eligibility is limited to missing the following courses: 3 SH of Human Anatomy, 3 SH of Human Physiology, 6 SH of General (or higher) Chemistry and/or 3 SH of College Algebra. Applicants must meet all IPAP application deadlines except for official transcripts of courses in progress or pending.

Applicants to the RCC will be boarded separate of the fully qualified applicants and may be selected if the board determines the applicant shows potential to successfully complete all academic requirements. Applicants selected for the RCC will be eligible to PCS to Fort Sam Houston for one semester of enrollment in a local college to complete an intense 4-month 15-semester hour college curriculum designed to provide these prerequisite courses. Costs of tuition and books will be at the student's expense. The Army and IPAP are exempt from any fiscal responsibility related to course enrollment in the RCC and will not reimburse tuition or book costs incurred by students. The Fort Sam Houston Education Center will assist students in their application for use of tuition assistance.

Applicants who wish to be considered for enrollment in the RCC must meet the following criteria:

1. Have at least 45 college credits, 15 of which include the resident prerequisite courses of 6 SH of English, 3 SH of Psychology, and 6 SH Humanities.
2. Have SAT scores of at least 450 in each section and have a minimum composite score of 1200 on the older version and 1800 on the newer version of the SAT.
3. Maintain an overall GPA and a science GPA of 2.5 or greater and receive a letter grade of "C" or better in each course.

Interested applicants are directed to review pages 7-9 of the FY 06 USAREC Update of AR 601-20 and the Application Memorandum for the IPAP Requirements Completion Course (RCC) – both of which are found on the IPAP website at: www.cs.amedd.army.mil/ipap and by clicking on the Army seal.

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Submitted by Catherine B. Foss

SEMPA Conference Administration

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CASUALTY EVACUATION FROM THE BATTLEFIELD

Donald L. Parsons, PA-C

Department of Combat Medic Training

Ft. Sam Houston, Texas

Casualty evacuation from the battlefield has always been a problematic event in the continuum of patient care. There are many factors for this; enemy fire, tactical considerations, limited availability of litters, prolonged arrival time of evacuation assets, and the mission itself. Many of these factors are beyond the control of the combat medic but the availability of litters is one that we will address in this paper.

During Combat Medic (91W MOS) training each individual is taught multiple different one and two man carries. However, in reality, the weight of the average soldier with his complete load (IBA, weapon, ammo, MOLLE gear, radio, etc.) is beyond the capability of most soldiers to pick up and move for any distance. There are field expedient methods to build a litter, to

help move casualties, but frequently many of these materials are not available. Since the standard canvas litter is not routinely carried onto the battlefield with the war fighters (too large and cumbersome), we must explore other avenues to move injured soldiers rapidly off the battlefield. Currently there are several assault litters that are compact and light enough for them to be carried by squad members into the foray. Two of the most commonly used are the SKED by SKEDCO products and the TALON LITTER by NORTH AMERICAN RESCUE PRODUCTS. Both of these litters are in use by various units in the Army today and have proven very effective in moving casualties off the battlefield. The ease in which casualties are moved over long distances with these devices make them much more applicable than manual carries for removing injured soldiers from the battlefield.

SKEDCO

Skedco makes a number of evacuation products for the military and rescue services. They have several different versions of their Sked litter. They make the traditional full size Sked, the Ranger Sked, the Collapsible Sked and even a Half Sked. All of these devices consist of differing sizes of a plastic sled that the casualty is placed on, secured to the Sked and using one or more other soldiers he is dragged to a casualty control point (CCP), helicopter landing zone (HLZ), or just out of the line of fire. In addition some have carrying handles on each side that allows others to help carry these injured soldiers. Distributing the weight of the casualty among several soldiers makes the movement faster and easier. The Ranger Sked and the Collapsible Sked are small enough and light weight enough that squad members can carry them into battle with minimal effort. These products have been used very successfully for years by the military and are much more efficient in moving casualties than trying to carry them for any distance. Their full size Sked also has the ability to be hoisted by an aircraft if unable to land. Another advantage of the Sked system is it can move heavy objects from one location to another. If you need to move 500 pounds of ammo or water, it can be done easily on a Sked. One disadvantage of the Sked litter is the fact that when it is dragged for any distance over rough terrain the plastic sled becomes hot and can actually burn your casualty. A sleeping mat or other padding between the casualty and the Sked will prevent this complication. In addition, if used in the winter time over snow or ice, the plastic can become very cold and insulation must be provided to protect the casualty also. While the Sked is a relatively simple means to evacuate casualties from the battlefield it is not a very stable evacuation platform, and may be somewhat deleterious to casualties with fractures of the pelvis or lower extremities. It is easily cleaned and when rolled back up and placed in its carrier it is ready to go again.



SKED Litter

TALON LITTERS

North American Rescue Products has developed several collapsible rigid litters that allow these products to go forward with the war fighters and provide a stable evacuation platform for soldiers to be transported on. All litters are US Army Rotary Wing Certified and Air Force Safe to Fly Certified. They meet the military 3X decontaminations standards, and satisfies the military and civilian fire safety codes. All litters meet NATO standards.

The different models include the Raven a bi-fold litter that extends into a standard sized litter. The Talon II, which is a quad fold litter which comes in two different sizes, an 81 inch model and a 90 inch model. The 81C is designed specifically for the Special Operations Forces and is more easily used in stairwells, hallways, and more confined spaces. It will even fit sideways in a UH-60 Blackhawk with the doors closed. The 90C fits all NATO evacuation platforms to include the UH-60 Blackhawk carousel. Each litter has attached patient securing straps that obviates the need for additional patient securing straps to be carried with the litter. Both the 81C and 90C have an optional carrying case that allows these items to be carried on the backs of the infantry squad members. The North American products are all easily disassembled for rapid cleaning and are guaranteed for life in defects in workmanship.



TALON II LITTER

One of the new medical tasks taught to every soldier entering Basic Combat Training, and as part of the new Combat Lifesaver Course is how to package a casualty for evacuation on an assault litter. When soldiers are injured, and unable to ambulate on their own, there is a need for a method to transport these casualties. If no litters are available at the point of wounding the soldier and his care provider must wait for an evacuation asset to arrive before a

litter will be available. This delays the packaging and transport of the casualty.

When the evacuation vehicle arrives, a standard litter must be off loaded. The litter must then be carried to the casualty, the casualty loaded on the litter, and then both carried back to the waiting aircraft, or vehicle. This puts the evacuation asset at risk while loitering until the casualty can be packaged and loaded onto the aircraft or vehicle. If assault litters are carried into the field by the assault element then the casualties can be packaged and ready to be rapidly loaded onto the evacuation asset and quickly transported out of the danger area.

It is time to look at how we intend to fight in the future. Standard canvas litters are not available to soldiers who are injured on the battlefield until an evacuation asset arrives. This delays the evacuation process and puts the injured soldier and the evacuation asset (either aircraft or vehicle) at risk. We need to incorporate assault litter as our standard line item for evacuation of our soldiers. The Marine Corps has already made this change. They have selected the Talon II 90C litter as their standard battlefield litter. The Army needs to make a similar decision for speed and safety of evacuation for our injured soldiers. Place assault litters out with the war fighter to speed recovery of our injured soldiers, and keep our care providers and evacuation assets safe.

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Z-Medica Launches QuikClot ACS™; New Evolution of its Lifesaving Blood Clotting Product Features Ingenious Delivery System

Advanced Clotting Sponge Offers Military & First Responder Users Numerous Benefits Including Improved Ease of Use

By Ellie Becker and Melissa Diamond

WALLINGFORD, Conn., August 16, 2005- Z-Medica Corp., a medical products company focused on innovative blood clotting technologies, has launched its latest product, QuikClot ACS™, a new formulation and delivery system for its flagship product QuikClot® hemostatic agent, a breakthrough product that quickly stops life-threatening arterial and venous bleeding. The new version – the advanced clotting sponge (ACS) — offers military and first responder users an alternative delivery system and numerous features that improve its ease of use. The evolution of the product is based on field observations and feedback, and Z-Medica’s commitment to continuous research and product improvement.

As was the case with the original QuikClot® hemostat, the new product was co-developed with the United State Navy and Marines and was tested by the Uniformed Services University of Health Sciences (USUHS) and the Naval Medical Research Center (NMRC). QuikClot® hemostat, an

inorganic molecular sieve, is already credited with saving more than 100 lives in Iraq and Afghanistan. Both products have 510(k) clearance from the FDA.

The new QuikClot ACS™ consists of beads contained in a porous surgical fabric that allows the activated beads to come into direct contact with blood in a wound and quickly stop the bleeding. Improvements and innovations include:

- Easy to apply. The user simply rips open the outer packaging, removes the advanced clotting sponge and packs it into the wound.
- Easy to remove. Once the patient has been moved from the scene of injury to the hospital setting, medical personnel simply remove the entire sponge.
- Effective packing into high pressure bleeding wounds.
- Can be applied rapidly, saving precious seconds and further limiting blood loss.
- Goes where it’s placed. Will not blow around in windy environments.
- Works where it’s placed – directly on the bleeding tissue.
- Can be applied to wound from any angle.

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HAPPY NEW YEAR!**