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1. REPORT DATE (DD-MM-YYYY) 
22/02/2018

2. REPORT TYPE 
poster

3. DATES COVERED (From - To) 
02/22/2018-02/23/2018

4. TITLE AND SUBTITLE 
An Elusive Diagnosis Following Cardiac Arrest

5a. CONTRACT NUMBER 

5b. GRANT NUMBER 

5c. PROGRAM ELEMENT NUMBER 

5d. PROJECT NUMBER 

5e. TASK NUMBER 

5f. WORK UNIT NUMBER 

6. AUTHOR(S) 
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 
59th Clinical Research Division
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8. PERFORMING ORGANIZATION REPORT NUMBER 
17573

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 
59th Clinical Research Division
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JBSA-Lackland, TX 78236-9908
210-292-7141

10. SPONSOR/MONITOR'S ACRONYM(S) 

11. SPONSOR/MONITOR'S REPORT NUMBER(S) 

12. DISTRIBUTION/AVAILABILITY STATEMENT 
Approved for public release. Distribution is unlimited.

13. SUPPLEMENTARY NOTES 
40th Annual Carrell-Krusen Neuromuscular Symposium, Dallas TX, 22-23 February 2018

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:
   a. REPORT 
   b. ABSTRACT 
   c. THIS PAGE

17. LIMITATION OF ABSTRACT

18. NUMBER OF PAGES

19a. NAME OF RESPONSIBLE PERSON 
Clarice Longoria

19b. TELEPHONE NUMBER (Include area code) 
210-292-7141

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. 239.16
Adobe Professional 7.0
An Elusive Diagnosis Following Cardiac Arrest

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*The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components

Case Presentation

49-year-old female was admitted after found unresponsive in bed. Cardiopulmonary resuscitation (CPR) was initiated by the husband followed by emergency medical services (EMS) who diagnosed ventricular fibrillation. She was intubated and advanced cardic life support administered with return of spontaneous circulation (ROSC) in the emergency department. Amiodarone was loaded and maintenance initiated. Workup for etiology of her ventricular fibrillation, including computed tomography (CT) of the head and CT angiogram of the pulmonary arteries, was negative. Left heart catheterization and ventriculography demonstrated no evidence for coronary artery disease, a reduced ejection fraction (EF) with global hypokinesis and dilated left ventricle. Episodes of ventricular tachycardia continued causing recurrent arrests with concomitant worsening metabolic acidosis and cardiac function. She was transitioned to venous-arterial extracorporeal membrane oxygenation (VA ECMO) with improved arrhythmias and metabolic acidosis but continued cardiogenic shock and increasing vasopressor requirements. Given concern for potential myocarditis and need for a left ventricular assist device (LVAD) or cardiac transplant, she was transferred to an outside hospital for further care.

Myocardial biopsy was negative for inflammatory changes consistent with myocarditis. Her hemodynamic stability and cardiac function improved from a nadir EF of 10-15% to 40-50% after 8 days of ECMO. While at the facility, she was treated with intermittent cisisracirium (Nimbeside), desmedetomedine (Precede), and fentanyl. ECMO was discontinued and she was transferred back to our hospital given no further need for LVAD or transplant. Cisisracirium was discontinued prior to transfer and desmedetomedine and fentanyl were discontinued on arrival. Due to persistent flaccid paralysis and inability to follow commands, Neurology was consulted.

Neurology Consultation/Exam

Additional History Obtained: Bilateral cataract removal over the past year reported by husband, mother of 3 healthy adolescent children with no history of miscarriage.

MS: Would attend to examiners when her name was spoken. Would not follow any simple commands to stick out tongue or close eyes and inconsistently appears to track to command.

CN: Bilateral ptosis of eyelids with inability to fully close eyes; bilateral temporal wasting noted. Otherwise grossly intact.

Motor/Sensation: Flaccid bilateral upper and lower extremities. 0/5 strength with volitional movement but with deep nalbuphine pressure patient able to withdraw both lower extremities against gravity.

Reflexes: bi tri BR pat Achilles plantar R 2- 2- 2- 0 0 equivocal L 2- 2- 2- 0 0 down.

Trace/possible Percussion myotonia of t tahaner eminence.

Gait: Unable to obtain.

Inpatient Evaluations/Studies

Serum Studies: Na 150 (down-trending from high of 158), NH3, TSH, CK, Lactate, VBG WNL.

CSF Studies: Unremarkable


MRI Brain w/wo contrast: No acute intracranial abnormality.

Train of Four: No evidence for persistent neuromuscular blockade.

NCS/EMG: NCS, including repetitive stimulation, unremarkable.

Muscle | Ins | Spontaneous Activity | Voluntary Act | Comments
---|---|---|---|---
Tibialis anterior | Inc | - | - | No activation
Vastus lateralis | NML | - | - | No activation
Abductor pollicis brevis | Inc | 2+ | - | No activation
4th dorsal interosseous | Inc | 2+ | - | No activation
Biceps brachii | NML | - | - | No activation


Final Workup/Diagnosis

Repeat EMG: Ins Act | Spontaneous Activity | Voluntary Motor Unit Potentials
---|---|---
Fibs | Fasc | Other | Recruitment | Dur | Amp | Poly
Debido(R) | NML | - | NML | NML | NML | NML None
Tripas brechii (Lateral head) | Inc | 3+ | Myot | NML | Long + | High + | 25%
Flexor digitorum profundus, dig 4 & 5. R | Inc | 1+ | Myot | Rapid + | Short + | Low + | 25%
Sternocleidomastoid(R) | Inc | - | Myot | NML | Short + | Low + | 25%
Tibialis anterior(R) | Inc | - | Myot | NML | Short + | Low + | 25%
Gastrocnemius (Medial head) | Inc | - | Myot | NML | Short + | Low + | None
Quadriceps(R) | Inc | 1+ | Myot | NML | NML | NML | None
T1 paraspinal(R) | NML | - | NML | NML | NML | NML | None
T10 paraspinal(R) | NML | - | NML | NML | NML | NML | None

DM9P Gene Analysis: 12 CTG Repeats on both alleles (No evidence of a repeat expansion identified).

4 Month Follow-Up

Repeat examination (notable findings):
- Bilateral ptosis with no fatigability, bilateral weakness of orbicularis oculi as well as cheek puff/lip pursing, Neck Flexion/Extension 4/5.
- Significant atrophy of bilateral temporals muscles - diffusely decreased bulk with strength as follows:
  - Upper: Del Tri Bi 3- WE FF FF HI
  - Right 5/5 5/5 5/5 5/5 5/5 5/5 5/5 5/5 5/5 4/5
  - Left 5/5 5/5 5/5 5/5 5/5 5/5 5/5 5/5 5/5 4/5
- Lower:
  - HF KE KE KF ADF APF EHL
  - Right 4+5 5/5 5/5 4+5 4+5 4+5 4+5 4+5
  - Left 4+5 5/5 5/5 4+5 4+5 4+5 4+5 4+5
- Reflexes: 1/4 in bilateral upper extremities; absent at the patella and Achilles' bilaterally; trace percussion myotonia of thenar eminence on left but absent at extensor compartment of forearm and tongue.
- Gait with exaggerated lordosis and 'waddling' type pattern.

Discussion

- Myotonic Dystrophy Type 1 is the most common muscular dystrophy of adulthood which affects between 1 per 8000-9000 individuals worldwide.
- Neuromuscular manifestations of myotonia and skeletal muscle disease may be subtle or overlooked by patients making exact onset of the disease difficult to ascertain and raises the possibility that a non-neurologist physician may be the first to evaluate these patients.

- EMG is the result of decreased expression of muscle-specific chloride channel type 1 (CIC-1) due to abnormal RNA processing from toxic gain of function of the transcribed DM1: repeat protein.
- Membrane hyper-excitability can be curtailed by altering sodium channel opening frequency or duration which is the basis for mexilitine therapy for myotonia. Our patient's lack of EM initially may be explained by the acute effects of amiodarone (shown to have Class IB antiarrhythmic properties acutely) versus her critical illness.
- Genetic testing has a low false negative rate, however, 5-9% of the DM1 population can have interrupting CCG, CTTG, and CCGE repeats within the CTTG repeat which can cause false negative studies.
- A potential confounder is dilution of the sample sent for testing. Average EMCO patients require 2 to 3 packed red blood cells and up to 14 plasma units and cryoprecipitate daily which, in our patient, obscured her initial serum genetic testing.
- DM1 patients have a hypersensitivity to anesthetic agents with prolonged recovery from sedation and propensity for potential prolonged mechanical ventilation, which likely contributed to our patient's initial presentation and prolonged hospital course.

This case re-affirms the importance of recognition of the stigmata of DM1, especially in care settings where the diagnosis may be missed. Typically, genetic testing and EMG/NCS can confirm the diagnosis; however, providers should be aware of potential false negatives to avoid abandoning the correct diagnosis in the face of initial negative results.
An Elusive Diagnosis Following Cardiac Arrest

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A 49-year-old female was admitted following ventricular fibrillation associated cardiac arrest with return of spontaneous circulation (ROSC) with advanced cardiac life support. Past medical and surgical history was notable for bilateral cataract removals over the preceding year. Family history was non-contributory. Workup for the arrest was unremarkable including computed tomography (CT) of the pulmonary arteries, left heart catheterization, and ventriculography. Her initial course was complicated by newly diagnosed dilated cardiomyopathy with reduced ejection fraction, ventricular tachycardia, and cardiogenic shock requiring venous-arterial extracorporeal membrane oxygenation (ECMO). Given concern for myocarditis, a myocardial biopsy was performed and negative for inflammatory changes. After discontinuation of ECMO, neurology was consulted due to failure to wean from the ventilator. Initial exam was significant for bilateral temporal wasting and ptosis with subtle percussion myotonia of the left thenar eminence. She had no volitional movement of her extremities and reflexes were hypoactive. Electroencephalogram and magnetic resonance imaging of the brain were unremarkable for seizure activity or evidence of anoxic injury, respectively. Given the findings of bilateral ptosis, possible percussion myotonia, temporal wasting, recent cardiac arrest, and early cataracts, a workup for myotonic dystrophy type I was pursued. Nerve conduction study and electromyography (NCS/EMG) did not demonstrate myotonic discharges and was only remarkable for reduced amplitudes of the left median and ulnar motor studies. DMPK gene analysis was negative, with only 12 CTG repeats. Follow up CNBP gene analysis for myotonic dystrophy type 2 (DM2) was also negative. The patient’s mental status and clinical state improved and she was discharged to a rehabilitation facility after placement of an implantable cardioverter defibrillator 2 weeks after initial consultation. The patient returned for further evaluation after recovery from her acute illness and repeat clinical exam, EMG/NCS, and ultimately genetic testing confirmed the underlying diagnosis.