Excited Delirium

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Objectives

• Recognize the signs and symptoms of excited delirium
• Describe the pathophysiology of excited delirium
• Discuss management of excited delirium in the prehospital setting
• Discuss the care of a patient with excited delirium in the emergency department
• Describe the association between conducted energy weapons and morbidity and mortality in the patient with excited delirium
Excited Delirium

• Bell (1849) - “acute exhaustive mania”

• 1985 - Miami physician describes “excited delirium” in a cocaine body packer

• 2009 - Formally recognized by the American College of Emergency Physicians
Excited Delirium - Presentation

• A state resulting from intoxication with sympathomimetic agents

  • Bizarre behaviour
  • Diaphoretic
  • Psychosis
  • Acute paranoia
  • Violence
  • “Superhuman” strength
  • Hyperthermia
  • Incoherent speech
  • Impervious to pain
  • Struggle despite restraint
Excited Delirium - Presentation

• Patients with excited delirium will have abnormal vital signs:
  • Tachycardia
  • Hypertension
  • Hyperthermia
  • Tachypnea
“The typical course of a published excited delirium syndrome patient involves acute drug intoxication, often a history of mental illness (especially those conditions involving paranoia), a struggle with law enforcement, physical or noxious chemical control measures or electrical control device (taser), sudden and unexpected death, and an autopsy which fails to reveal a definite cause of death from trauma or natural disease.”

ACEP Excited Delirium Task Force 2009
Excited Delirium  Pathophysiology

• Not yet fully understood

• Dysregulated dopamine transport by sympathomimetics - sympathomimetics block the transporters, leading to increased dopamine at the synaptic cleft

• Hypothalamic dopamine receptors are responsible for thermoregulation
Excited Delirium  Pathophysiology

- Post mortem studies have shown a cocaine concentration similar to recreational drug users, and less than those with deaths attributed to cocaine overdose.
Why do patients with excited delirium die?

- Catecholamine excess?
- Respiratory arrest?
- Cardiotoxicity?
- Rhabdomyolysis?
- TASERs?
Catecholamine Excess

• Hyperdopaminergic state can result in hyperthermia from dysregulation by the hypothalamus
  • Case series of 90 excited delirium fatalities showed a core body temperature average of 40.7°C (Takeuchi, 2011)

• Excess catecholamines causing cardiac stress?
  • Acute stress cardiomyopathy
  • Dysrhythmia - Ventricular dysrhythmias have been shown to be very uncommon in these patients (Vilke, 2012)
Respiratory Arrest

- Potential death resulting from respiratory fatigue caused by struggle against restraints or law enforcement personnel

- Positional asphyxia because of restraint use
  - Studies have shown a lack of evidence for hypoxia or hypoventilation in restrained patients (Chan, 1997) - however, these studies were done with healthy volunteers
• In a review of deaths of patients in physical restraints (Berzlanovich, 2012):

  • 26 deaths in restrained individuals

  • 3 died of natural causes

  • 22 caused by physical restraints (11 attributed to strangulating, 8 to chest compression, 3 dangling in head-down position)

  • In 19 of these, the restraints were incorrectly applied
Cardiotoxicity

- Cocaine use predisposes patients to coronary artery disease, cardiac hypertrophy, and myocardial fibrosis.

- Thickening of intramyocardial arteries in cocaine uses may predispose to ischemia, especially in the setting of increased demand in excited delirium.
Rhabdomyolysis

• Breakdown of skeletal muscle resulting in release of myoglobin, potassium, and other potentially toxic products, causing renal failure, as well as hyperkalemia

• Physical exertion and fighting against law enforcement/restraints can predispose these patients to rhabdomyolysis

• Cocaine use alone is also a cause of rhabdomyolysis
TASERs

• Conducted Energy Weapons (CEWs)
  • Result in neuromuscular incapacitation of individuals

• Safe in healthy individuals, but there is little data studying those under the influence of drugs, psychiatric disorders, or excited delirium
TASER X26

- Powered by two 3V lithium batteries
- Compressed nitrogen shoots two tethered probes with an 11m range
- Probes penetrate epidermis and dermis by 4-5mm
- Current is delivered for up to 5 seconds
TASER X26

- 19 short pulses are delivered per second
- 1.76 joules per pulse
- 1200 volts/5 second pulse
Question 1
TASERs

- No evidence of cardiac ischemia or dysrhythmias for exposures up to 15 seconds

- Most injuries result from falls (head injuries) or at the site of entry of the probe
Excited Delirium: Differential Diagnosis

- Excited delirium shares signs and symptoms with a number of other medical conditions.

- Keep a wide differential diagnosis to avoid missing any potentially life-threatening medical emergencies.
Excited Delirium: Differential Diagnosis

- Hypoglycemia
- Heat stroke
- Neuroleptic Malignant Syndrome
- Serotonin Syndrome
- Intracranial hemorrhage
- Thyrotoxicosis
- Bipolar disorder
- Schizophrenia
- Infectious (meningitis/encephalitis/syphilis)
Prehospital Management of Excited Delirium
2:30 am

- A call is received for a patient with “bizarre behaviour”, police already present at the scene
- Upon EMS arrival, a naked man is screaming at police in the middle of the street
• Officer reports that the individual was tasered multiple times, but it was barely effective

• Police are eventually able to subdue the patient when back-up arrives and they are able to restrain the patient to the stretcher
Question 2
Patient Restraints

- Restraints can present a number of serious complications:
  - Aspiration
  - Positional asphyxia
  - Rhabdomyolysis
  - Abrasions/bruising at restraint sites
  - DVT (prolonged)
Patient Restraints and the BLS v2.0, Section 8

Take Home Points:

• Your safety is priority

• Ensure allied resources available, team approach

• Restrain if at direct request of physician, police, or if becoming violent en-route
Restraints

• Avoid body restraints as may cause impaired respiration

• Do not remove restraints en-route to hospital

• Frequent reassessments
Back to the Case
• After the patient is restrained in supine position, he continues to fight against the restraints while screaming and spitting at EMS and police

• You are unable to obtain any vital signs

• What is your next step? This question is for the ACPs

• PCPs next step?
Question 3
Chemical Restraint

• ACP auxiliary medical directive lists midazolam as an option for combative patients
Chemical Restraint

Conditions

Midazolam
AGE: ≥18 years
LOA: N/A
HR: N/A
RR: N/A
SBP: Normotension
Other: No reversible causes (i.e. hypoglycemia, hypoxia, hypotension)
Chemical Restraint

MANDATORY PROVINCIAL PATCH POINT:

Patch to BHP for authorization to proceed with midazolam if unable to assess the patient for normotension or reversible causes.
## Chemical Restraint

<table>
<thead>
<tr>
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<th>Route</th>
<th>Route</th>
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<tbody>
<tr>
<td></td>
<td>IV</td>
<td>IM</td>
</tr>
<tr>
<td><strong>Dose</strong></td>
<td>2.5-5 mg</td>
<td>2.5-5 mg</td>
</tr>
<tr>
<td><strong>Max. single dose</strong></td>
<td>5 mg</td>
<td>5 mg</td>
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<tr>
<td><strong>Dosing interval</strong></td>
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<tr>
<td><strong>Max. total dose</strong></td>
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<td>10 mg</td>
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<tr>
<td><strong>Max. # doses</strong></td>
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Patient Restraints

- Once patients have been chemically restrained and calmed, physical restraints may be gradually removed in the ED
- One limb at a time is removed - one arm, then one leg, etc.
Back to the Case

• After the excitement has died down, you remember the officers telling you that he was “tased” multiple times

• Taser probes are embedded in right chest and lower abdomen

• Patient is now calm and cooperative
Taser Probes…

• Should you remove them?
  • Weigh risk versus benefit
TASER Probe Removal
Probe Removal

Conditions

Probe Removal

AGE: ≥18 years
LOA: Unaltered
HR: N/A
RR: N/A
SBP: N/A
Other: N/A
Question 4
Probe Removal

**Contraindications**

Probe removal

Probe embedded above the clavicles, in the nipple(s), or in the genital area
Probe Removal

- Cut wires with trauma shears
- Stabilize skin around the embedded probe
- Pull probe straight out using forceps
- Dispose of probes appropriately in designated container
First Reported Complication in the Literature

TASER® DART INGESTION

Eric M. Koscove, MD

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Darwin Award Goes to…

The patient was then brought to the ED and transported to the police vehicle. While enroute the victim stated, “I’ve got something of yours… I swallowed one of the darts.” When asked why he did that, he responded that he believed the police were going to kill him and he swallowed one of the darts so that when an autopsy was performed on him, the Taser dart would be found and “they would know it was the police” that killed him (personal communication, Officer D. Kono, June 3, 1985).

Figure 2. Admission abdominal x-ray study with metallic Taser dart.
Emergency Department Management of Excited Delirium
Emergy Department Management of Excited Delirium

• Excited delirium is a medical emergency

• Patients with excited delirium may present with:
  • Agitation
  • Rhabdomyolysis
  • Acidosis
  • Hyperkalemia
  • Hyperthermia
  • Prolonged QT
  • Cardiac arrest
Agitation

- First line treatment: benzodiazepines

- Second line: antipsychotic agents (haloperidol)

- Midazolam and haldol can be administered together from the same syringe (ex. 5mg haldol with 2mg midazolam)
Agitation

- Ketamine: IM and IV administration of ketamine have been studied, but optimal dosing is unknown - many patients also received benzos as well

- IM: 4mg/kg is recommended
- IV: 0.5-1mg/kg

- There have been cases of respiratory depression requiring intubation
Hyperthermia

- Cooled IV fluids (2L NS)
- Ice packs to groin, axilla
- Fans with water misting patient
Rhabdomyolysis

- Breakdown of skeletal muscle with the release of potentially toxic intracellular contents

- Can be caused by the physical exertion of fighting against restraints/police or hyperthermia

- Complications:
  - Hyperkalemia
  - Renal failure secondary to intraluminal cast formation, haem protein induced cytotoxicity
  - Acidosis
Rhabdomyolysis

• Management of rhabdo involves:
  • IV fluid administration
  • Treatment of hyperkalemia
  • Treatment of compartment syndrome
  • Dialysis if renal involvement
Hyperkalemia - K+ 7.1
Hyperkalemia - K+ 8.5
Hyperkalemia - K+ 9.0
Hyperkalemia

- Potassium level does not always result in specific ECG changes

- All patients will respond differently - one patient with a potassium of 6.5 may have dangerous ECG changes, while another with 8.5 may only have peaked T waves
Hyperkalemia

- Calcium gluconate: 10ml of 10% sol’n over 2-3min
- 10 units regular insulin, 1 amp D50W
- Salbutamol: 10-20mg nebulized
- Sodium bicarb: 50mmol
- Dialysis
Emergency Department Management

- These patients will often have to be sedated, paralyzed and intubated to allow treatment of the complications of excited delirium.

- Ensuring the safety of care providers is an important aspect of treating excited delirium.
Excited Delirium - Summary

- Excited delirium is a medical emergency

- Always rule out any other medical causes of agitation

- Be aware of your surroundings and be safe

- Restraints can be used safely and can prevent harm to the patient and caregivers when used appropriately
Questions?
References


Berzlanovich, A. “Deaths due to physical restraint” 2012


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Thank You!