INDUCED HYPOTHERMIA

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OBJECTIVES

- Define and explain Induced Hypothermia
- Discuss both pre-hospital and in hospital use of Induced Hypothermia in post cardiac arrest patients with return of spontaneous circulation (ROSC).
- Review two recent Induced Hypothermia cases that occurred at SJMC
- Question and Answer

What is Induced Hypothermia?

- **Therapeutic hypothermia** is a medical treatment that lowers a patient's body temperature in order to help reduce the risk of the ischemic injury to tissue following a period of insufficient blood flow
Benefits of Induced Hypothermia following ROSC

- Decrease cerebral metabolism therefore decreasing the need for oxygen
- Reduces the cellular levels of glutamate
- Reduces intracellular acidosis
- Decreases the inflammatory response
- Protects the blood brain lipomembranes

Who do we cool?

Emergency Department:
- Nontraumatic cardiac arrest with ROSC
- Core Temperature greater than 34° Celsius (94° F) at presentation.
- Time to initiation of hypothermia is less than 6 hours from ROSC
- Comatose after ROSC: GCS less than 8 AND no purposeful movement to pain

Who do we cool?

Pre-Hospital:
- Post Cardiac arrest patients with ROSC
- ROSC not related to blunt/penetrating trauma or hemorrhage
- Age 12 or older with adult body habitus
- Advanced airway in place with no purposeful response to pain
- Do not delay transport
How do we cool them?

- Pre-hospital Induced Hypothermia is accomplished very easily.
  - Apply ice packs to the groin, arm pits, and neck over the carotids.
  - Some rescue units have cooled saline.
- The application of ice packs is currently being done throughout the UH medical command system with great success.

How do we cool them?

- In-hospital Induced Hypothermia can be accomplished in several ways:
  - Ice packs
  - Fans
  - Intravenous cooling
  - Naso-Gastric lavage with ice cold 0.9% Normal Saline
  - Endovascular cooling

Alsius Intravascular Temperature Management Systems
Currently in use at SJMC
A 53 yr old male falls head first into approximately 2ft of water in an outdoor sump pump in his back yard that he and his neighbor are attempting to clean.

The neighbor is unable to pull him out and calls 911
Westlake Police arrive and after several minutes are able to remove the man from the well using a rope.

The patient is apneic, blue and has no pulse when pulled from the well and CPR is initiated.

On arrival of the Westlake Fire Department

- EKG Monitor shows asystole
- CPR is continued
- Patient is intubated
- IO access is established

Time 1356

- Patient has Return to Spontaneous Circulation (ROSC)
- Vital signs obtained
  - BP – 171/110
  - Pulse – 110
  - Resp – 2 with minimal effort
- Patient transported
Arrival at SJMC ED

- Time 1403
- Vital signs
  - BP – 192/116
  - Pulse – 92
  - Patient being ventilated @ 10-12 bpm with 100% O2
  - GCS 3

NOW THE PROBLEM
Which came first the chicken or the egg?

- Was this a trauma arrest from a head injury?
- Was this a near drowning?
- Did the patient arrest prior to hitting the water?
- Is it a combination of 2 or all 3?

To Cool or To Warm?
That is the question

- If he arrested first then we need to cool
- If he is a trauma or near drowning we need to warm
ED Management

- Triple Lumen catheter is placed in the right Subclavian Vein. Labs and blood cultures are obtained.
- At 1419 patient is sent to CT for pan scans of the Head, C-spine, Chest, Abdomen and Pelvis.
- By the way - Lab results reveal ETOH 0.331 and tox + for Cocaine

ED Management

- At 1427 – head CT is Negative for bleed or fracture.
- Hospital Intensivist is contacted and the decision to initiate Therapeutic Hypothermia is made.
- Cooling catheter is placed and Patient is admitted to the ICU.

ICU Management

- Therapeutic Hypothermia is continued and the patient remains sedated and on a ventilator.
- Antibiotic coverage is initiated based on history and method of injury.
- On 3/31/2010 24 hour after Therapeutic hypothermia was initiated patient is allowed to begin to re-warm.
ICU Management

- By 4/3/2010 the patient is still requiring sedation and mechanical ventilations.
- He is “bucking the vent” and is hypotensive and hemodynamically compromised.
- He is positive for both staph and strep.
- Patient in full blown septic shock.

On 4/9/2010 Patient is extubated and proclaims “I’m not paying for any of this.”

Case Presentation #2

January 30, 2011
Time 2010

By June he is able to travel to Asia unaccompanied to bring home his fiancé.
A 55 Yr Old male, with a history of depression is found by his daughter hanging in the garage.

Family cuts the victim down, he is blue, 911 is called and family begins CPR.

The Police department arrives to find the patient apneic and has no pulse. CPR is continued until the Fire department arrival.

At 2017 The Fire Department arrives on scene.

- Patient placed on monitor and shows a sinus rhythm with a pulse.
- Patient has no respiratory effort
- Advanced airway attempted with success.
- BVM ventilations continued with an SpO2 of 98%.
At 2017 The Fire Department arrives on scene.

- Vital signs
  - BP – 156/92
  - Pulse – 83
  - Resp - 0 (BVM @ 10 - 12 bpm)
  - GCS 3
  - IV Establish and patient transported to SJMC

ED Management

- Patient arrives at SJMC ED at 2044
- Vital signs
  - BP – 97/76
  - Pulse – 78
  - Resp - agonal spontaneous
  - Temp – 97°F
  - Patient noted to have decerebrate posturing.

ED Management

- Patient intubated
- Triple Lumen catheter and arterial line places
- At 2100 sedation is initiated and the Alsius cooling catheter is placed.
- CT scan of head and c-spine is negative for bleed or fracture and Therapeutic Hypothermia protocol is initiated.
- Patient admitted to ICU
ICU Management

- Therapeutic Hypothermia continued
- Patient remained sedated and on a ventilator with a core temperature of 32.8°C
- LifeBanc referral is made

ICU Management

- On 1-31-2011 after 24 hours of cooling, rewarming process is initiated to a core temperature of 36.5°C
- On 2-1-2011 Patient remains intubated but is following commands
- On 2-2-2011 - CPAP is initiated and patient is weaned from the ventilator and extubated. Patient also has a psych evaluation.

ICU Management

- On 2-3-2011 - Patient is up in a chair, taking a regular diet, alert and able to speak.
- On 2-4-2011 - Patient is transferred to an in-patient psych facility.
What's Next ??

- **Pre-Hospital Therapeutic Hypothermia in all EMS agencies**
  - This will involve protocol changes and training.
  - This will also require a change in thinking to get us away from the “status quo / the way we always did it” thought process.

Pre-Hospital Therapeutic Hypothermia

- **Pre-Hospital Therapeutic Hypothermia is**:
  - Easy to implement
    - All you need is 6 to 10 ice packs
  - Easy to learn
    - All non-trauma Cardiac Arrests that have ROSC should have cooling started by placing ice packs in the groin, arm pits, and neck over the carotids

Pre-Hospital Therapeutic Hypothermia

- Pre-hospital Therapeutic Hypothermia is already being done successfully by EMS services in the Greater Cleveland Area.
- In the new 2010 AHA Guidelines it recommends that patient with ROSC following cardiac arrest with lack of meaningful response to verbal commands should be cooled to 32°C to 34°C for 12 to 24 hours.
Level 1 Cardiac Arrest Centers

- **Level One Cardiac Arrest Centers** - the equivalent of a Level 1 Trauma Center
  - Hospitals with the ability to provide 24/7 care for post cardiac arrest patients with ROSC.
  - These centers that are springing up around the country provide:
    - Emergent PCI Capabilities
    - Rapid induced hypothermia capabilities
    - Optimal management in an ICU
    - Electro-physiologic evaluation

At the first Level 1 Cardiac Arrest Center in St. Cloud Minn. the result has been a 50% increase in the hospital discharge rate.

SUMMARY

- Therapeutic Hypothermia is a simple yet effective way to improve neurologic outcome and survivability from sudden cardiac arrest.
- Therapeutic hypothermia should be implemented in both the in-hospital and pre-hospital care of patients with ROSC following cardiac arrest.
- The establishment of Level 1 Cardiac Arrest Centers is an essential step in the care of post cardiac arrest victims that continues to have success across the country.