

## Crush Injury

HARRT 2004

## Crush Syndrome



- A panoply of systemic manifestations that arises once a victim sustains a compressive force of sufficient duration and severity to cause muscle crush injury and cell death
- Principal complications are associated with heart and kidney
- *Heart Effects:* Result of Hyperkalemia
- *Kidney Effects:* Result of myoglobin and uric acid precipitation in renal tubules, decreased glomerular filtration, and nephrotoxic effect of ferrihemate (a dissociation of myoglobin in the acidic environment of the renal parenchyma.)

## Earthquake Ernie

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- Right Leg
  - Crushed, poor arterial flow, little or no venous return
    - Regional ischemia due to impaired macro- and microcirculation
- Rest of him
  - Dazed, in pain



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- Right Leg
  - Muscle cells injured heading toward death (Rhabdomyolysis)
    - Derangements of oxidative-glycolytic pathways
    - ATP depletion
    - Profound changes in intracellular electrolyte composition
      - K<sup>+</sup> leaves cell
      - Ca<sup>++</sup> enters cell
      - Na<sup>+</sup> enters cell
      - Exit of internal proteases
      - Myoglobin exits
- Rest of him
  - Glad to be alive!
    - Except for leg pain, rest is okeedokee
    - Damn it! Help!



## Earthquake Ernie

- Right Leg
  - Hours later, more myocytes inevitably go from ischemic to dead. It is a gradual process because:
    - Speed of Ca<sup>++</sup> shift is slowed due to vascular occlusion
    - Superoxides and H<sub>2</sub>O<sub>2</sub> are low due to ischemic mitochondria
    - Surrounding acidosis is cyto-protective
- Rest of him
  - Hungry, thirsty
  - Can't feel leg

