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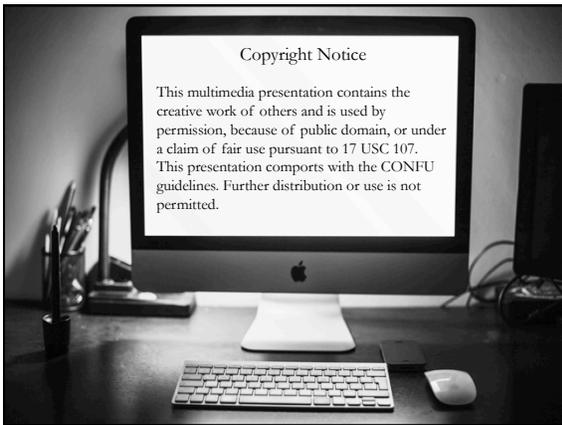
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## BLUF

- Lack of visible evidence is common.
- Comprehensive medical evaluation doesn't occur in the majority of strangulation cases.
- Preconceived ideas about strangulation are rampant, particularly in a culture that embraces combatives.
- Non-lethal strangulation of intimate partners has substantial direct health effects and is associated with an increased risk of later lethal violence by a partner or ex-intimate partner (Laughon, et al., 2008)

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## Understanding Strangulation as a Mechanism of Injury

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### Definitions

- Strangulation is a form of asphyxia characterized by closure of the blood vessels and air passages of the neck as a result of external pressure on the neck.
- Medically speaking, it is blunt force trauma to the neck and should be treated as such.

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### Definitions

Suffocation: process that impedes or halts breathing.

- Smothering: mechanical obstruction of the flow of air from the environment into the mouth and/or nostrils.
- Choking: partial or complete foreign body occlusion of the trachea by a foreign body
- Confined space entrapment: inadequate oxygen in the enclosed space

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Definitions

Compression asphyxia (also known as *burking*): mechanically limiting expansion of the lungs by compressing the torso, limiting a person's ability to breathe

Seven horizontal lines for taking notes.



Definitions

- Asphyxia: a condition caused by inadequate intake of oxygen.
  - Caused by injury or obstruction of the airway
- Hypoxia: reduction of oxygen supply to the tissue below physiological levels.
- Anoxia: an absence of oxygen supply to the tissues (a more severe form of hypoxia)

Seven horizontal lines for taking notes.



- The brain needs a continuous supply of oxygen. Without it, brain cells quickly malfunction and die.
- Brain cells do not regenerate.
- There are two vital bodily systems that must work perfectly and in unison—the respiratory (breathing) system and the cardiovascular (blood flow) system.
- There are multiple vulnerabilities in both of these systems, which is why strangulation needs to be taken seriously.

Seven horizontal lines for taking notes.

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## Anatomy of the Neck



- Spinal Cord
- Airway
- Vascular supply to the brain

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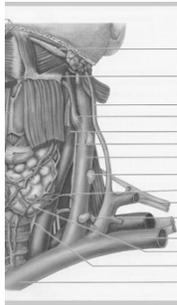
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## Anatomy



- Carotid arteries
  - Supply the head neck and brain
  - Branches to the internal and external arteries which supply the brain and eyes; the throat, neck glands, tongue, face, mouth, ear, scalp and meninges
- Jugular veins
  - Two external; two internal
- Trachea
  - 20 rings of cartilage and connective tissue
- Thyroid
  - Butterfly gland; large blood supply; nerves important to voice quality

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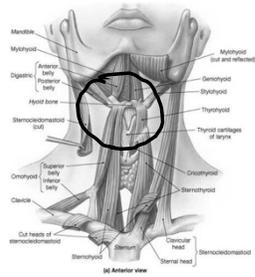
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## Anatomy



- Horseshoe shaped bone in between the chin and thyroid ligament
- The only bone in the body not connected to any other bone
- Allows movement of the tongue, pharynx, larynx by connecting muscles
- Supports the weight of the tongue allowing speech, articulation, vocalization

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### Venous Obstruction

- Blocking the jugular veins causes congestion of the blood vessels and increased venous and intracranial pressure.
- Impacts return of blood from the brain, resulting in a build up of blood in the brain that doesn't contain enough oxygen.
  - Dilating veins rupture causing petechiae (external and internal) and subconjunctival hemorrhage

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### Arterial Obstruction

- Compression of and resulting injury to the carotid arteries impedes oxygen delivery to the brain.
  - Compressing one side can result in neurological findings (including weakness, numbness and tingling) on the opposite side.
  - Bleeding and tearing of the artery can cause blood clots to form, impacting blood flow—generally a delayed finding
    - Clots can break free and travel to the brain

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### Airway Obstruction

- External force to the anterior neck can result in injuries to the soft tissues of the neck, esophagus, larynx, trachea, cervical spine, and the laryngeal and facial nerves.
  - Can be immediate or signs/symptoms can develop over time

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### Compression of the Carotid Sinus

- Pressure on the carotid sinus can cause acute bradycardia (a too slow heart rate) or cardiac arrest.
- Generally requires sustained pressure for 3-4 minutes before altered consciousness.

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### Loss of Consciousness

Due to a combination of factors:

- Apnea (cessation of breathing)
- Arterial obstruction
- Venous obstruction
- Autonomic nervous system reflexes (the control system of your body, regulated by the hypothalamus)

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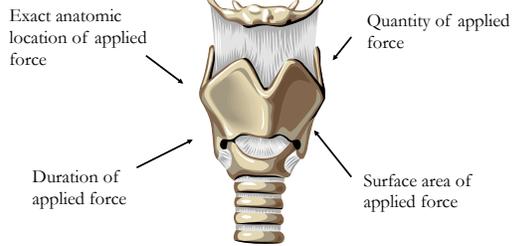
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### Variables Required for Effective Strangulation



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## Clinical Evaluation of Strangulation Patients

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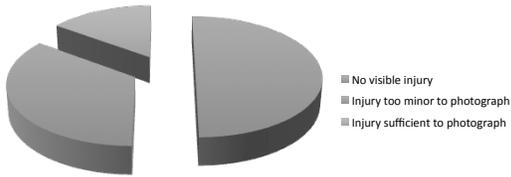
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### Strangulation Injury



Gael B. Strack, George E. McClane, and Dean Hawley, A Review of 300 Attempted Strangulation Cases Part I: Criminal Legal Issues, 21 J. Emergency Med., 303 (2001)

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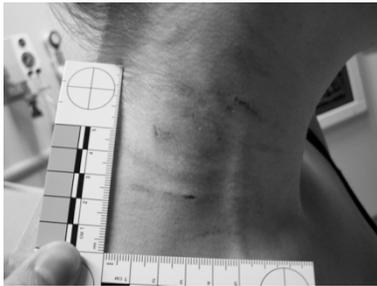
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## What You Think We Will See



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Clinical Evaluation

- Comprehensive clinical evaluation is about more than identifying and documenting visible injury.
  - Includes specific history to identify issues immediately after event and at time of presentation.
  - May include some type of imaging, such as CT, MRI, doppler studies or even xray.
  - Dangerousness assessment (ideally)
  - Tailored discharge instructions for identifying emergent issues upon release.

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### Use of ALS As a Clinical Tool

- Has become much more popular to use this technique to identify subclinical bruising.
- Idea is that ALS allows visualization of bruises not yet visible to naked eye.
- Single study in Journal of Forensic Nursing found 98% of strangulation patients had identified subclinical bruising to the neck with ALS (Holbrook & Jackson, 2013)

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### Use of ALS As a Clinical Tool

HOWEVER, more reliable research later concluded: "our results demonstrate that more than half of the time, positive fluorescence is something other than a bruise. There is no evidence base, therefore, to support the use of an alternate light source as an independent tool to definitively interpret fluorescence as a sub-clinical bruise (i.e., bruising that is not visible to the naked eye). Given the high false-positive rate in detecting subclinical bruising, it is essential for medical and legal professionals to understand the resulting implications of promoting the use of ALS in a forensic setting." (Lombardi, et al., 2015)

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### Use of ALS As a Clinical Tool

- Counsel should proceed cautiously when bringing out ALS evidence (whether to comment on findings or failings of the treating clinician)
- Science has not progressed to the point that this tool is reliable in identifying subclinical bruising.
- Clinicians adamant about its use should be questioned about the limitations of the science upon which they are relying (small sample size, no comparison group, no replication of findings).

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*Means Likely*

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**Aggravated Assault**

**(a)** Any person subject to this chapter who attempts or offers with unlawful force or violence to do bodily harm to another person, whether or not the attempt or offer is consummated, is guilty of assault and shall be punished as a court-martial may direct.

**(b) Any person subject to this chapter who—**

**(1)** commits an assault with a dangerous weapon or other means or force likely to produce death or grievous bodily harm; or

**(2)** commits an assault and intentionally inflicts grievous bodily harm with or without a weapon; is guilty of aggravated assault and shall be punished as a court-martial may direct.

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**What's Causing Serious Bodily Harm?**

- Anoxia can cause seizures, loss of consciousness, incontinence, and pulmonary edema, among other issues
- Increased intracranial pressure can cause petechiae and subconjunctival hemorrhaging
- Blunt trauma to the anterior neck can cause injury (including hematomas and swelling) to the trachea and larynx, resulting in neck swelling, difficulty/pain with swallowing, respiratory issues and subcutaneous emphysema

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## What's Causing Serious Bodily Harm?

- Blunt trauma to the carotid arteries can cause dissections, and ultimately stroke
- Repeated hypoxic events can cause neurologic symptoms to increase over time and in frequency, including one-sided weakness, paralysis, facial droop, eye droop, ringing in ears, memory loss, and sensory deficits

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## Identifying Vessel or Airway Occlusion by History

- Victim identifies:
  - Inability to breathe
  - Narrowing of vision, spots before their eyes
  - Hearing changes, such as roaring in ears or sounding like being in a tunnel
  - Loss of consciousness
  - Seizure
  - Loss of bladder or bowel control

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