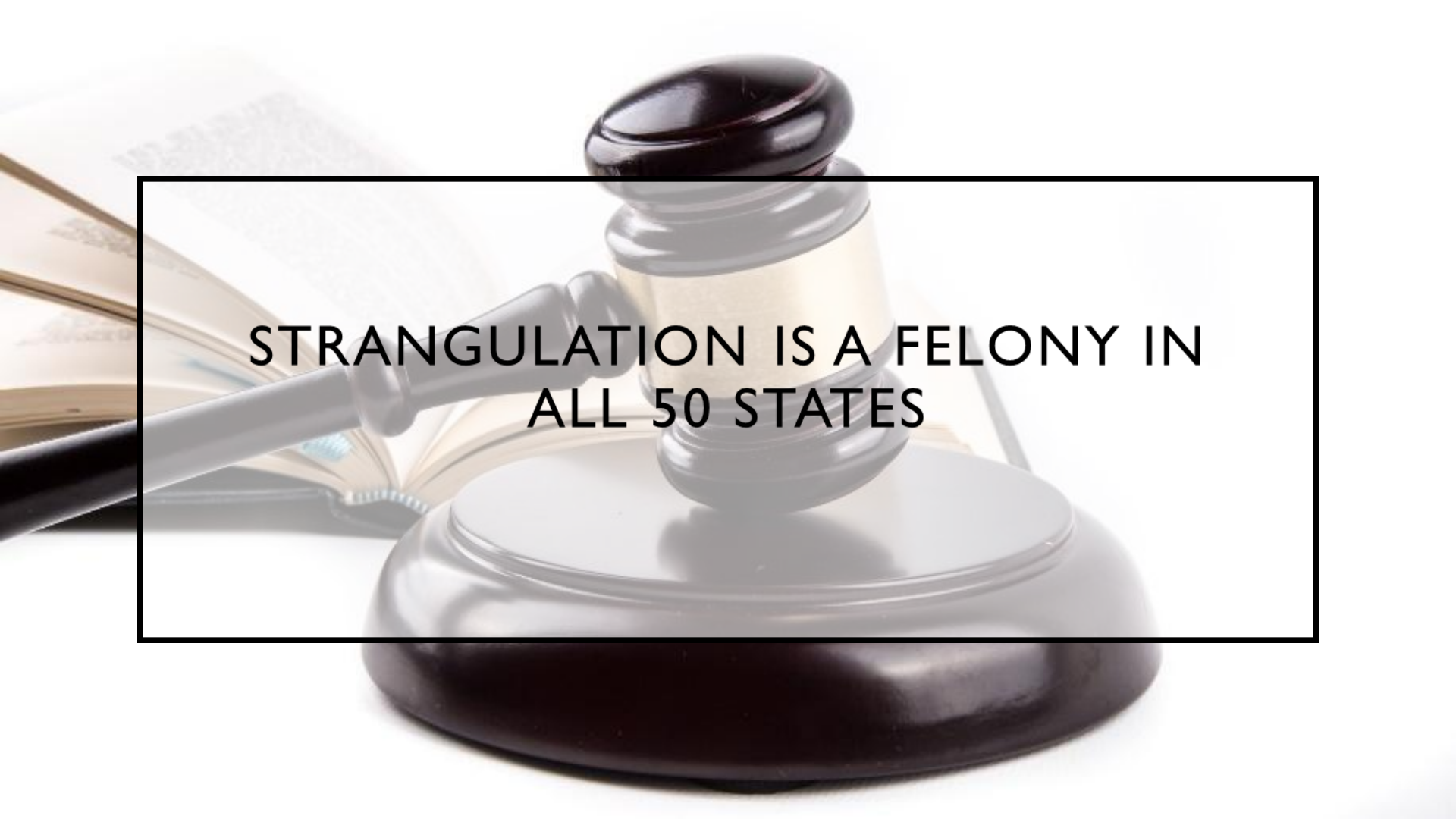
Strangulation to Stroke: Unmasking Hidden Vascular Injury

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Objectives

- Recognize strangulation as a stroke risk
- Understand vascular injury
- Review CTA research
- Apply imaging decisions



STRANGULATION IS A FELONY IN ALL 50 STATES

Why This Matters

HIGH LETHALITY RISK

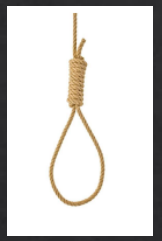
OFTEN MINIMAL VISIBLE INJURY

COMMON IN IPV

DELAYED STROKE RISK

What is Non-Fatal Strangulation?

- **Strangulation – external pressure applied to the neck that impedes air flow, blood flow, or both. There does not have to be a complete obstruction.**
- *Hanging* – occurs when a person is suspended with a ligature around their neck.
- *Ligature* – pressure is applied around the neck with an object.
- *Manual* – occurs when pressure is applied to the neck with hands, arms, or legs.







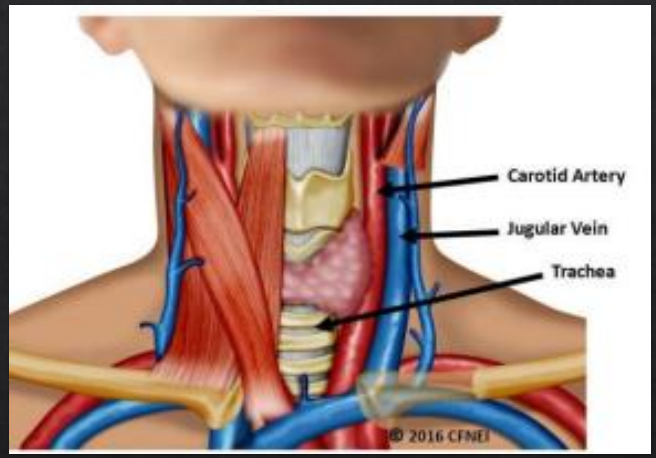
Blood vessels

Carotid compression → ↓ brain perfusion

Jugular compression → ↑ intracranial pressure

Both → hypoxia

Vessel injury (tears/dissection) → stroke risk



Pathophysiology

Neck compression → vascular injury

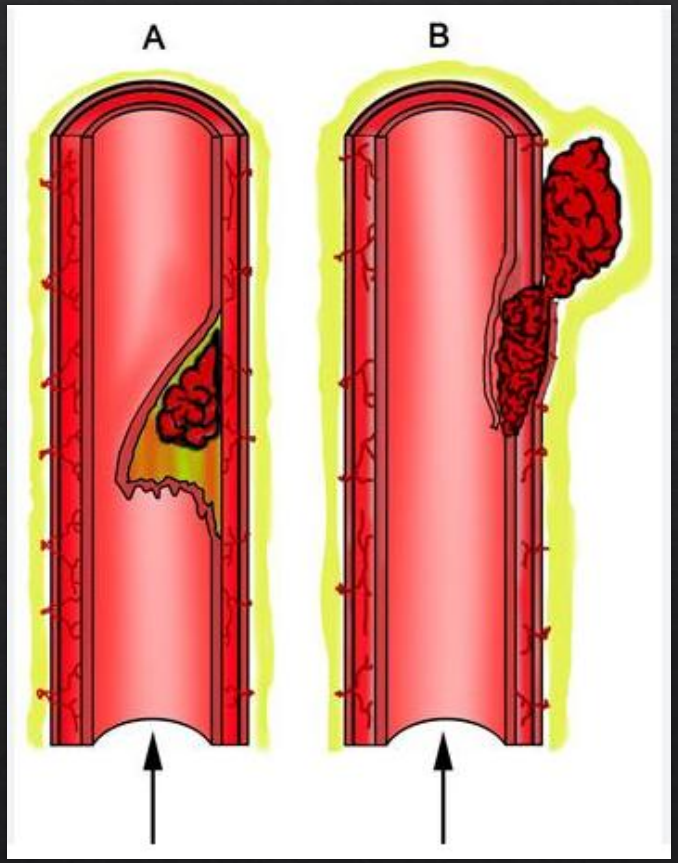
Intimal tear → dissection

Thrombus → embolic stroke

Zuberi et.al Study Overview 2020

- 142 patients
- CTA use in strangulation
- Low but significant vascular injury rates

THE ODDS OF HAVING A CAROTID DISSECTION AFTER A NEAR OR NON-FATAL STRANGULATION ASSAULT IS **1/47**



Zuberi et. al Key Findings

- 15.5% any injury
- ~2–4% vascular injury
- Conclusion: low yield, but very clinically significant

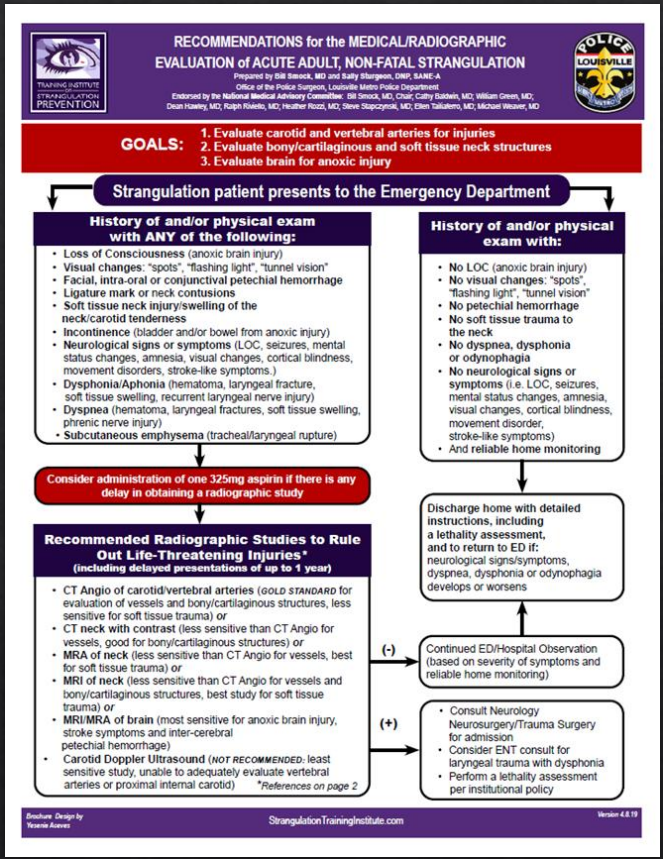
Clinical Reality

- Symptoms poorly predict internal injury
- Minimal exam findings common with visible injury (62.2%)
- Cannot rule out internal injury clinically

Stroke Risk

- Dissection may lead to stroke
- Can occur hours to days or weeks later
- Missed injury = preventable stroke

Imaging Recommendations



RECOMMENDATIONS for the MEDICAL/RADIOGRAPHIC EVALUATION of ACUTE ADULT, NON-FATAL STRANGULATION

Prepared by Bill Smock, MD and Sally Sturgeon, DNP, SANE-A
Office of the Police Surgeon, Louisville Metro Police Department
Endorsed by the National Medical Advisory Committee: Bill Smock, MD, Chair; Cathy Baldwin, MD; William Green, MD; Dean Hawley, MD; Ralph Riviello, MD; Heather Rozzi, MD; Steve Stapczynski, MD; Ellen Taliaferro, MD; Michael Weaver, MD

GOALS:
1. Evaluate carotid and vertebral arteries for injuries
2. Evaluate bony/cartilaginous and soft tissue neck structures
3. Evaluate brain for anoxic injury

Strangulation patient presents to the Emergency Department

History of and/or physical exam with ANY of the following:

- **Loss of Consciousness** (anoxic brain injury)
- **Visual changes**: "spots", "flashing light", "tunnel vision"
- **Facial, intra-oral or conjunctival petechial hemorrhage**
- **Ligature mark or neck contusions**
- **Soft tissue neck injury/swelling of the neck/carotid tenderness**
- **Incontinence** (bladder and/or bowel from anoxic injury)
- **Neurological signs or symptoms** (LOC, seizures, mental status changes, amnesia, visual changes, cortical blindness, movement disorders, stroke-like symptoms.)
- **Dysphonia/Aphonia** (hematoma, laryngeal fracture, soft tissue swelling, recurrent laryngeal nerve injury)
- **Dyspnea** (hematoma, laryngeal fractures, soft tissue swelling, phrenic nerve injury)
- **Subcutaneous emphysema** (tracheal/laryngeal rupture)

Consider administration of one 325mg aspirin if there is any delay in obtaining a radiographic study

Recommended Radiographic Studies to Rule Out Life-Threatening Injuries*
(including delayed presentations of up to 1 year)

- CT **Angio of carotid/vertebral arteries** (*GOLD STANDARD* for evaluation of vessels and bony/cartilaginous structures, less sensitive for soft tissue trauma) *or*
- CT **neck with contrast** (less sensitive than CT Angio for vessels, good for bony/cartilaginous structures) *or*
- **MRA of neck** (less sensitive than CT Angio for vessels, best for soft tissue trauma) *or*
- **MRI of neck** (less sensitive than CT Angio for vessels and bony/cartilaginous structures, best study for soft tissue trauma) *or*
- **MRI/MRA of brain** (most sensitive for anoxic brain injury, stroke symptoms and inter-cerebral petechial hemorrhage)
- **Carotid Doppler Ultrasound** (*NOT RECOMMENDED*- least sensitive study, unable to adequately evaluate vertebral arteries or proximal internal carotid)

*References on page 2

History of and/or physical exam with:

- **No LOC** (anoxic brain injury)
- **No visual changes**: "spots", "flashing light", "tunnel vision"
- **No petechial hemorrhage**
- **No soft tissue trauma to the neck**
- **No dyspnea, dysphonia or odynophagia**
- **No neurological signs or symptoms** (i.e. LOC, seizures, mental status changes, amnesia, visual changes, cortical blindness, movement disorder, stroke-like symptoms)
- And **reliable home monitoring**

Discharge home with detailed instructions, including a lethality assessment, and to return to ED if: neurological signs/symptoms, dyspnea, dysphonia or odynophagia develops or worsens

(-) Continued ED/Hospital Observation (based on severity of symptoms and reliable home monitoring)

(+)
- Consult Neurology Neurosurgery/Trauma Surgery for admission
- Consider ENT consult for laryngeal trauma with dysphonia
- Perform a lethality assessment per institutional policy

Brochure Design by Yesenia Aceves

StrangulationTrainingInstitute.com

Version 4.8.19

Here is the female version, male is the same except it doesn't have the HCG.

Strangulation — ✔ Accept

- ☐ aspirin tablet 325 mg (if delay in obtaining radiographic study)
  325 mg, Oral, ONCE
- ☐ CT angiogram neck with contrast ($$)
- ☐ MRI angiogram extracranial without contrast (if patient is pregnant) ($$)
- ☑ BMP ($$)
  STAT, First occurrence today at 1351
  Blood
- ☑ CBC ($$)
  STAT, First occurrence today at 1351
  Blood
- ☑ HCG QuaNtitative ($$$)
  STAT, First occurrence today at 1351
  Blood
- ☑ ED Peripheral IV Lock and PRN Flush Panel

ED Peripheral IV Lock and PRN Flush Panel

- ☑ Saline lock IV - initiation/placement order
  STAT, ONE TIME, First occurrence today at 1351
- ☑ sodium chloride 0.9% syringe 5-10 mL
  5-10 mL, Intravenous, PRN, starting today at 1350, until Thu 10/22 at 1349, Line Care, Flush with 5 mL saline pre/post IVP, and 5 mL prior to IVPB or blood product administration. Protocol for PERIPHERAL IV saline lock maintenance, flush with 3-5 mL saline syringe every 8 hours.
  Flush every shift or after IV medication
- ☑ sodium chloride 0.9% IV line flush 50 mL
  50 mL, Intravenous, at 999 mL/hr, PRN, starting today at 1350, until Thu 10/22 at 1349, Line Care, Flush with 50 mL after IVPB to insure complete administration of the dose. May use the saline infusion to back flush IVPB tubing as needed.
  Use this order to document priming and flushing IV line after medication administration.

- ☑ [NC]: Neuro assessment
  STAT, ONE TIME, First occurrence today at 1351
  Neuro assessment
- ☑ Neurological checks
  STAT, EVERY HOUR, First occurrence today at 1351, Until Specified
- ☐ Transfer to Cincinnati Children's Hospital
  STAT, ONE TIME, Transfer to Cincinnati Children's Hospital

Next Required — ✔ Accept

St. Elizabeth Program Data (2021-2025)

- 564 CTAs
- 20 positives: which included but not limited to:
  - Jugular dissections-1
  - Vertebral dissections- 2
  - Carotid dissections- 5
  - Other findings: aspiration pneumonia, laryngeal edema and tear, and pseudoaneurysms of the vessels & trachea, and chronic abnormalities
- 3.5% with positive findings
- 1.5% vascular injury

Key Program Insight

- Low positivity
- Findings can be life-threatening
- Supports continued CTA use

Practice Implications

- Maintain low threshold for CTA
- Do not rely on physical exam alone
- Early detection

Key Takeaways

- Strangulation = vascular emergency
- Stroke risk is real and delayed
- CTA is critical despite low yield

Case Study

- 32 yo female arrives to St. Elizabeth Emergency Room for Assault in police custody (warrant)
- History of assault: He hit her, pushed her to the ground and "choked" her
- Placed 2 hands on neck with multiple attempts
- Patient denied loss of consciousness
- No external signs of injury

Case Study Cont'd

- Self reported symptoms:
  - Urinated oneself
  - Raspy Voice
  - Trouble swallowing and painful swallowing
- No imaging completed
- 7 days later came in with altered mental status and right sided weakness
- CT Head showed large left MCA infarct

***Reviewing the chart for the presentation patient has returned multiple times to the ER for seizures.

Questions?

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- Leeann.Guffey@stelizabeth.com



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