

CASES

OF NOTE

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A Case of Nonfatal Strangulation Associated With Intimate Partner Violence

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ABSTRACT

Intimate partner violence (IPV) is a significant public health problem that has profound effects on the physical and psychological well-being of millions of Americans. It is known that strangulation is one of the most lethal forms of IPV. Frequently, a lack of visible external trauma is present, and attempted strangulation may be accompanied by other more severe injuries to the head and face; thus, the signs and symptoms of nonfatal strangulation may be overlooked. Because the emergency department (ED) is frequently the first point of contact for an individual who has experienced any type of IPV, it is imperative that providers have the knowledge and skill set for the identification and management of this patient population. The purpose of this article is to present a discussion of the challenges faced by ED providers in the clinical decision-making process when caring for a patient who has experienced nonfatal strangulation. **Key words:** domestic homicide, intimate partner violence, strangulation

INTIMATE PARTNER VIOLENCE (IPV) is a significant public health problem that has profound effects on the physical and psychological well-being of millions of

Americans (Centers for Disease Control and Prevention [CDC], 2019). At its core, the definition of IPV includes physical violence, sexual violence, stalking, and psychological aggression (including coercive tactics) by a current or former intimate partner (i.e., spouse, friend, or ongoing sexual partner) (CDC, 2019). It is estimated that the prevalence of lifetime IPV affects more than 12 million Americans, with approximately 25% of women and 10% of men reported having experienced IPV during their lifetime (CDC, 2019; Smith et al., 2018). The economic toll of IPV on the U.S. economy is also substantial,

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estimated to exceed \$9.3 billion annually including direct (e.g., medical care) and indirect costs (e.g., lessened productivity and earnings) (McLean & Bocinski, 2017).

The body of research on most aspects of IPV is abundant; however, there is a paucity of evidence specifically examining strangulation in the context of IPV. Over the last two decades, research has emerged from interprofessional disciplines including nursing, medicine, law enforcement, and forensic scientists that delineates strangulation as a unique and exceptionally dangerous form of IPV. Women are the most common gender to experience attempted strangulation, with a documented sevenfold increase in subsequent femicide in this population (Glass et al., 2008). It is now known that strangulation is one of the most lethal forms of IPV, with firearms being the primary cause of fatal injuries (Ertl et al., 2019; Petrosky et al., 2017).

IPV AND NONFATAL STRANGULATION: A CHALLENGE FOR THE EMERGENCY CARE PROVIDER

Survivors of IPV can experience a wide spectrum of signs and symptoms, ranging from the undetectable to injuries that are fatal. Of particular concern to emergency department (ED) providers is the recognition of survivors of attempted strangulation, as they frequently have no visible external signs of trauma. In a groundbreaking study conducted by Strack, McClane, and Hawley (2001), only 50% of strangulation survivors had any visible injuries and only 15% of that population had an injury of sufficient quality to be used as photographic evidence. The lack of visible injury in the patient with nonfatal strangulation has been supported in subsequent studies (Joshi, Thomas, & Sorenson, 2012; Matusz et al., 2020; Pritchard, Reckdenwald, & Nordham, 2017). In addition to a nonvisible injury, patients may not openly disclose that attempted strangulation was part of the assault; however, it is documented that up to 68% of IPV survivors experienced nonfatal strangu-

lation by an abuser (Taliaferro, Hawley, McClane, & Strack, 2009).

By definition, strangulation associated with IPV occurs when an abuser applies external pressure to a victim's neck in a way that diminishes cerebral blood flow and/or occludes the airway (Pritchard et al., 2017; Taliaferro et al., 2009). The act of strangulation is often described by the victim as "being choked." In contrast to intentional strangulation, the term "choking" refers to internal blockage of the trachea by a foreign object that can occur accidentally or intentionally among individuals who participate in the "choking game" (Strack et al., 2014). From a medicolegal perspective, it is critical that ED providers are precise in differentiating attempted strangulation from choking. The following patient scenario describes a near-fatal episode of strangulation associated with IPV.

CLINICAL CASE PRESENTATION

Clinical History

A 20-year-old woman presented to the ED via EMS with a chief complaint of physical assault by her ex-partner. The patient reported that this assault occurred just prior to arrival to the ED. During the triage process, a domestic violence screening assessment was performed and was negative despite the current chief complaint. The two standard screening questions that were asked were as follows: (1) "Do you feel safe at home?" and (2) "In the past year, have you been hit, slapped, kicked, or harmed by your partner or caregiver?" Of note, the patient later reported to the forensic nurse that she had been assaulted by this partner in the past, but it was more than 1 year ago.

The patient reported that she was visiting from out of town and agreed to meet her ex-partner at a motel to introduce him to their infant daughter. During this meeting, the patient reported that she fell asleep but was awakened by being struck in the head by her former partner. She reported that he had been looking through her phone and became

angry, which precipitated the assault. The patient stated that she tried to leave the motel room but was grabbed by her assailant and then manually strangled two times. She reported during the assault that she felt like she was “fighting for my life” and “thinking I was going to die.” She described a complete loss of vision, during which time she could hear the assailant yelling but was unable to see anything. She reported that she was gasping for air and felt like she could not breathe. This was followed by a loss of consciousness. Immediately following the assault, she was able to get away from the assailant and call 911. During the 911 call, she reported gasping for breath, experiencing hoarseness, and vocal changes and had experienced bladder incontinence.

Review of Systems

The patient reported a sore throat and “throbbing” headache since the assault. She also complained of anterior and lateral neck pain, described it as feeling like a “ring of fire.”

Past Medical History

This included asthma and back pain. She had no known allergies and denied taking any prescribed medications.

Physical Examination

Vital signs: Pulse: 115 beats/min; blood pressure: 125/87 mmHg; respiratory rate, 20 breaths/min; SaO₂, 94% at room air.

General appearance: A moderately distressed appearing young woman, accompanied by her 4-month-old infant. She was alert, expressive, and easily engaged with the ED providers.

Her hair and clothing appeared disheveled and makeup appeared smeared.

HEENT: Subconjunctival hemorrhage of the left eye. Petechiae of the left eyelid and left cheek inferior to the left eye. Venous congestion noted to the left eyelid. Erythema noted to the bridge of nose externally; no

nasal drainage noted. Tympanic membranes intact bilaterally. Erythema noted to helix of the right ear, right posterior auricular area, and posterior base of the skull. Mucous membranes moist and atraumatic.

Neck: Numerous abrasions and areas of patchy erythema noted to the left and right lateral neck. Parallel linear redness noted to right lateral neck, with white sparing between markings. Associated neck tenderness with palpation and pain to neck encircling the neck, which was exacerbated by lateral neck movement. Mild swelling noted to the anterior neck and inferior chin.

Lungs: Clear to auscultation bilaterally.

Heart: Mild tachycardia, no murmurs or rubs.

Gastrointestinal/genitourinary: Abdomen soft, nontender.

Skin: Numerous areas of patchy erythema noted to the anterior chest and upper back. Numerous linear abrasions across the chest and upper back. Bruising noted to the right scapula. Two 12-cm parallel linear abrasions noted to right lateral abdomen. Erythema and small abrasions noted to bilateral knees. Bruising and edema noted to the right lower leg. Jagged broken nail noted on the left index finger.

Forensic Evidence Collection

Swabs of the patient's neck and fingernails were collected by the forensic nurse for the assailant's DNA analysis. A buccal swab was collected to establish the known patient DNA profile. Clothing had been collected on scene by police prior to patient transport to the ED.

Labs/Imaging

A complete blood cell count with differential, comprehensive metabolic panel, urinalysis, and urine pregnancy test were ordered. A computed tomographic (CT) scan without contrast of the head and a CT angiogram (CTA) of the neck were ordered. The laboratory and radiographic test results were reassuring, with no abnormal findings.

Disposition

Social work was consulted for assistance with discharge and safety planning. Referrals were made to a local domestic violence shelter and advocacy group. The patient was advised of return precautions related to new or worsening shortness of breath, difficulty swallowing, neck swelling, seizures, change in mental status, or thoughts of self-harm. The patient was then discharged.

PATHOPHYSIOLOGY OF STRANGULATION

Attempted strangulation is the ultimate method that an abuser can use to exert power and control in a relationship as it communicates to a victim that “I can kill you at any time.” In essence, it is a mode of mechanical asphyxia caused by the application of pressure on the neck by one or two hands (mechanical strangulation), a constricting band (ligature strangulation), or an arm (chokehold strangulation). The neck is vulnerable to life-threatening injuries due to its small diameter, lack of skeletal protection, and close proximity to major vessels, the airway, and the spinal cord (see Figure 1). The injuries that result from strangulation vary in severity based on the biophysics of trauma and are related to the exact location of applied force, amount of force exerted, duration of time that the blood vessels and airway are occluded, and the method used (Zilkens et al., 2016). The clinical sequence of strangulation is initially described as an extremely painful experience that progresses to extreme panic, with loss of consciousness, followed by death (McClane, Strack, & Hawley, 2001). Death can result from complete occlusion of the carotid arteries within a time period of less than 2 min (see Figure 2).

The biomechanics of strangulation initially involves compression of the jugular veins as it takes a minimal amount of pressure, approximately 4.5 pounds per square inch (psi), to occlude these vessels. In comparison, the amount of pressure required to open a can of soda is 6 psi (Gwinn, Strack, & Smock, 2017). Compression of the jugular

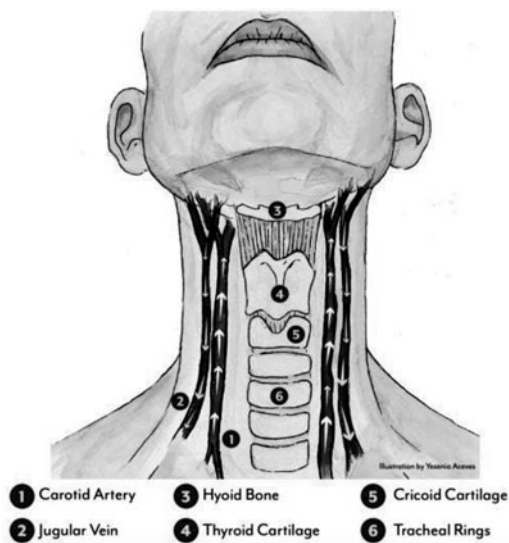


Figure 1. Vital structures of the neck. From Alliance for HOPE International (2019). Retrieved from <https://www.familyjusticecenter.org/wp-content/uploads/2018/09/Vessels-Diagram-v7.26.18-8.5x11.pdf>.

veins results in cerebral venous congestion, increased intracranial pressure, stagnant hypoxia, loss of muscle tone, and unconsciousness. A stronger force is required for occlusion of the carotid arteries, which ultimately leads to cerebral hypoxia and anoxic encephalopathy. The accompanying compression of the carotid sinus results in acute bradycardia and/or cardiac arrest. If the act of strangulation does not cease, the voluntarily controlled strap muscles of the larynx relax, leaving the vessels completely unprotected (Taliaferro et al., 2009). Although a less common cause of death, tracheal occlusion can occur but requires pressure at a level of approximately 33 psi, the equivalent of a male handshake (Gwinn et al., 2017).

The cells of the brain have varying sensitivity to the effects of anoxia, and brain cell death may occur at different rates. It is estimated that cerebral anoxia results in the loss of 32,000 neurons lost per second. The hippocampus, as the “memory center” of the brain, is extremely sensitive to anoxia and thus damage to this area may cause impairment of the memory if the patient survives.

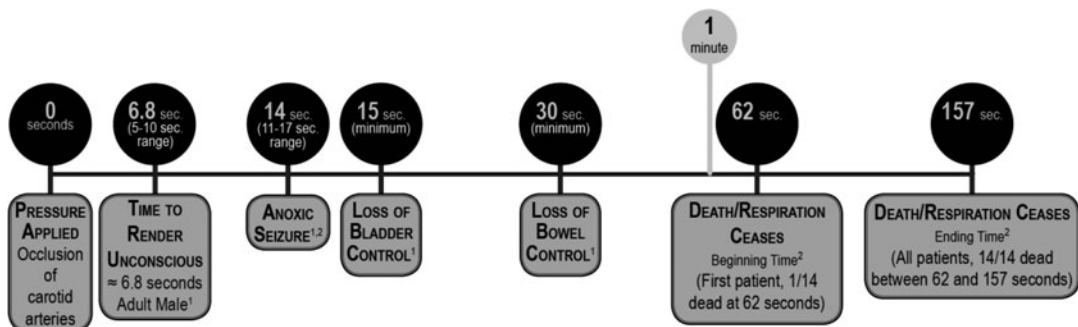


Figure 2. Physiological consequences of strangulation: Occlusion of arterial blood flow timeline. From Carter et al. (n.d.).

Progressive cerebral anoxia can lead to increasing cerebral edema, herniation, and death. If the patient survives, lifelong neurological impairment of varying severity may result (Taliaferro et al., 2009).

One of the most lethal and missed injuries sustained during a nonfatal strangulation is a carotid artery dissection. The trauma inflicted on a carotid artery may disrupt the tunica intima of the vessel and lead to the development of a thrombus or thrombi. These clots can subsequently embolize and travel to the brain, blocking a distal artery. Neurological findings of a stroke may appear in the acute phase or may present at a later time. Cases of delayed death occurring months or years after nonfatal strangulation have been reported as a result of a cerebral infarction secondary to carotid dissection (Matusz et al., 2020; Strack et al., 2014).

Other potential injuries that the ED provider must be astutely aware of in the acute postinjury phase include behavioral changes such as acute agitation and violence, memory impairment, changes in level of consciousness, loss of sphincter control, internal airway edema, respiratory failure, aspiration pneumonia, seizures, cervical spine injuries, hyoid bone fractures, thyroid storm, and mental health complaints. Delayed airway edema is of particular concern as swelling of the neck can occur up to 48 hr after a strangulation attempt (Zilkens et al., 2016). Airway edema is associated with an increased potential for lethality.

APPROACH TO THE PATIENT IN THE ED: MEDICAL DECISION-MAKING

Clinical History

Accurate diagnosis and medical management are imperative to mitigate the short- and long-term health consequences of nonfatal strangulation. Universal screening for IPV in the ED setting has become the standard of care since the recommendations brought forward by the U.S. Preventative Services Task Force (USPSTF) in 2013 (USPSTF, 2019). Unless the ED provider is knowledgeable regarding the history to obtain from an IPV survivor, the appropriate questions may not be asked and occult injuries including nonfatal strangulation may be overlooked.

Obtaining an accurate clinical history is dictated by the stability of the patient and time since the attempted strangulation event occurred. As with all patients, information should be obtained regarding past medical history, social history, and a complete review of systems. The ED provider must then ask focused questions because the survivor of a nonfatal strangulation may present with a myriad of symptoms and not disclose the attempted strangulation as a component of their assault. Reasons cited as to why survivors of nonfatal strangulation may not disclose this information include impaired memory, lack of knowledge regarding the seriousness and potential short- and long-term consequences, preoccupation with other injuries, fear for their life, or an overall

misunderstanding of the term “strangulation.” Table 1 lists focused questions to assist the ED provider in obtaining essential information from an IPV survivor about nonfatal strangulation.

Women who have been strangled may report a myriad of symptoms including dyspha-

Table 1. Examples of focused questions to ask an intimate partner violence survivor regarding nonfatal strangulation

- At any time did your assailant place his hands or other object on your neck?
- Describe and demonstrate on the head model how you were strangled. One hand? Two hands? Arm? Leg? Other object(s)?
- How many times were you strangled?
- How long did the strangulation(s) last?
- Was your head pounded on the ground or wall while you were being strangled?
- Did your feet leave the ground while you were being strangled?
- What did you think was going to happen?
- What did the assailant say to you before, during, and after you were strangled?
- On a scale of 0–10, how much pressure was applied to your neck during the strangulation(s)?
- Did you or do you currently have any changes in your vision? (seeing spots, tunnel vision, blurry vision, everything went black, etc.)
- Did you become dizzy, lightheaded, or pass out?
- Did you or do you currently have any changes in your hearing? (roaring, ringing, etc.)
- Did you have any difficulty breathing or an inability to breathe? Cough?
- Did you or do you currently have trouble swallowing?
- Did you have a hoarse, raspy, or complete loss of voice?
- Did you vomit as a result of being strangled?
- Did you lose control of urine or stool while you were being strangled?
- Have you been strangled prior to this event? /How many times?

Note. From Strack and Agnew (2013).

gia, dysphonia, visual changes, neck pain, loss of consciousness, and incontinence of urine and/or stool. Strangulation is frequently accompanied by other injuries to the head and face that may be more apparent and severe; thus, the symptoms of strangulation may be overlooked. A key element to obtaining an accurate history is that a survivor is more likely to disclose the vicious act of attempted strangulation if the emergency care provider has the knowledge and skill set to ask the appropriate questions.

Physical Examination

The physical examination requires a comprehensive head-to-toe evaluation, with the patient completely undressed. Because there is no correlation between the visibility of external signs of trauma and the severity of underlying injury, the ED provider must maintain a high index of suspicion with each patient. A systematic approach to the physical examination is essential so as to not overlook any subtle injuries that may prove to be life-threatening or have forensic implications for future prosecution. Table 2 lists a focused approach to the physical examination of a patient who has sustained a nonfatal strangulation injury.

Diagnostic Workup

All injuries identified through the primary and secondary trauma surveys should be evaluated and diagnostic tests ordered appropriately. For any patient who has sustained a nonfatal strangulation injury, a CTA of the carotid/vertebral arteries is considered the “gold standard” for the evaluation of these vessels and the bony/cartilaginous structures. As stated by Dr. William Smock, Police Surgeon for the Louisville Metro Police Department and the Chairperson of the Training Institute of Strangulation Prevention Medical Advisory Board, “Given the current state of our medical knowledge and the morbidity and mortality associated with a missed arterial injury in the neck, it is malpractice

Table 2. Focused physical examination of a patient who has experienced nonfatal strangulation

Body system	Physical examination findings	Pathophysiology
Skin	Contusions, abrasions, ligature marks	Direct trauma (<i>Note:</i> Thumb generates more pressure than other fingers)
	Curved or linear abrasions on the face, neck, and hands	Defensive wounds in an attempt to remove the abuser's hand or object from the neck
	Petechiae on the face, neck, eyes, ears, and buccal mucosa	Increased venous pressure, asphyxia
Eyes	Subconjunctival hemorrhage	Increased venous pressure, asphyxia
	Periorbital petechiae	CNS anoxia, direct trauma
	Visual changes (e.g., seeing spots, flashing lights)	
Ears	Ecchymosis behind the ears, hemotympanum	Increased venous pressure, direct trauma
	Tinnitus	Carotid artery aneurysm
Mouth	Edema, contusions, abrasions	Direct trauma
	Petechiae on the soft palate, buccal mucosa	Increased venous pressure, asphyxia
Neck and throat	Contusions, abrasions, edema, ligature marks	Direct trauma
	Curved or linear abrasions on the face and neck	Defensive wounds in an attempt to remove the abuser's hand or object from the neck
	Hoarse, raspy voice, aphonia; dysphagia, sore throat	Asphyxia, direct trauma
Chest	Contusions, abrasions, edema, Dyspnea, respiratory distress, subcutaneous emphysema	Direct trauma
		Laryngeal injury, soft-tissue swelling, hematoma, hyoid bone fracture, aspiration, pneumomediastinum
Neurologic	Loss of memory, dizziness, change in level of consciousness, behavioral changes, seizures, incontinence of bladder and/or bowel	Cerebral hypoxia/anoxia
	Behavioral health symptoms	Traumatic experience
Cervical spine injury	Varying loss of sensation, movement	Direct trauma

Note. CNS = central nervous system. From Gwinn, Strack, and Smock (2017); Hawley, McClane, and Strack (2001).

not to order a screening CTA in the nonfatal strangled patient”.

Use of a CTA affords the provider the opportunity to identify clinically significant injuries, including carotid artery dissection, and injuries to the cervical spine and anterior neck structures. Unfortunately, the CTA is expensive and carries the risk of radiation exposure, particularly to the thyroid gland, which

is a radiosensitive organ. The possibility of a false-positive scan has also been cited with CTA, as the specificity is lower than that with a convectional angiogram (Matusz et al., 2020). The National Medical Advisory Committee recommends CTA imaging in the presence of high-risk clinical signs and symptoms as listed in Table 3 (Smock, 2015). Other diagnostic tests may be indicated depending

on the patient’s history and physical examination findings. Laboratory tests including a toxicology screen, coagulation studies, pregnancy test, continuous noninvasive pulse oximetry monitoring, noncontrast head CT scan, cervical spine CT scan, chest radiograph, magnetic resonance image/magnetic resonance angiogram of the head, and bedside laryngoscopy should be considered. The decision to order any diagnostic image is always at the discretion of the ED provider.

MEDICOLEGAL CONSIDERATIONS

Documentation

Attempted strangulation is a felony in the majority of states as codified by state law. From a medicolegal perspective, precise documentation of the patient’s history and physical examination is critical evidence toward successful prosecution. Emergency care providers should collaborate with forensic nurses and law enforcement for the completion and documentation of a meticulous evidentiary examination. It is recommended that a detailed strangulation-specific assessment documentation tool based on current evidence is implemented. Although patients with nonfatal strangulation typically elude standards for forensic evidence collection, it is recommended that body mapping of injuries,

photo documentation, illumacams, and life-like mannequin doll heads for demonstration are used as part of the comprehensive evidentiary examination (International Association of Forensic Nurses, 2016; Pritchard et al., 2017). Biological and trace evidence collection should also include specimens of moist and dry secretions (e.g., blood stains, saliva) obtained from the following areas: face, head, neck, mouth, and fingernails.

PATIENT DISPOSITION

It is the recommendation of most experts that survivors who have experienced an episode of nonfatal strangulation are admitted to the hospital for observation for up to a period of 48 hr due to the possibility of delayed sequelae including laryngeal edema (Strack et al., 2014). For the patients who are discharged from the ED, it is essential that they are provided with detailed discharge and return precaution information. The patient should be informed that serious internal injuries may have a delayed onset of symptoms, and it is therefore advised that the patient stay with someone they trust for a minimum of the first 24 hr. Specific discharge information should include oral and written instructions to advise the patient to return to the ED immediately if any of the following develop: any neurological signs/symptoms, neck swelling, dyspnea, dysphonia, dysphagia, acute anxiety; or suicidal ideation. The discharge instructions should also include referrals for medical and psychosocial follow-up including patient advocates.

Table 3. Clinical indications for the computed tomography angiogram of the neck

Loss of consciousness
Visual changes
Facial, intraoral, or conjunctival petechiae
Neck contusions or ligature marks
Soft-tissue swelling
Carotid tenderness
Incontinence
Neurological symptoms
Dysphonia
Dyspnea
Subcutaneous emphysema

Note. From Smock (2015).

CONCLUSION

Nonfatal strangulation associated with IPV has been receiving increasing attention over the last two decades, and much has been learned through this effort. A gap in knowledge continues to exist, and there is a crucial need for advancement in research and clinical practice to support care of this patient population and enhance prosecution. Studies have highlighted the critical role

that emergency care providers perform in the medical screening and management of this patient population due to the potential for significant short- and long-term complications, as well as the increased likelihood of future femicide. Effective interprofessional partnerships between ED care providers and law enforcement, forensic experts, and others will further augment this effort. A significant opportunity exists for providers in emergency care to expand and disseminate the emerging body of evidence regarding all aspects of nonfatal strangulation.

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