

STANDARDS of CARE

EMERGENCY AND CRITICAL CARE MEDICINE®

FROM THE PUBLISHER OF COMPENDIUM

TRACHEAL LACERATIONS

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Tracheal laceration is an uncommon but potentially life-threatening condition in small animals. This injury often has different causes in dogs than in cats. In published reports, the most common cause in cats was iatrogenic trauma resulting from overinflation of cuffed endotracheal tubes during general anesthesia. When tracheal lacerations are identified in dogs, they are often the result of a severe injury. The types of injuries that cause tracheal lacerations in dogs also occur in cats, but cats rarely survive the injury.

Dogs that have sustained blunt force trauma, such as being hit by a car, may have tracheal laceration because of the increased pressure in the thorax while the glottis is closed. This high pressure creates a rent in the tracheal membrane. Alternatively, dogs can present after penetrating trauma, such as bite or ballistic injuries. Whereas bite wounds are typically located in the cervical and thoracic inlet region, ballistic wounds may be intra- or extrathoracic.

These types of injuries may be clinically apparent hours to days after the initial trauma. Dogs and cats most frequently present with tachypnea, dyspnea, or subcutaneous emphysema. Pneumomediastinum or pneumothorax may also be present.

If clinical signs are present and the patient is dyspneic, medical therapy, including oxygen supplementation, treatment for hypovolemic shock, and pain management, is critical. Thoracocentesis may be necessary for stabilization if the animal is in respiratory distress and lung sounds are not auscultated, suggesting

pleural space disease. If signs are mild and the patient is stable, further diagnostics can be pursued.

DIAGNOSTIC CRITERIA

Historical Information

- History of trauma: Vehicular, bites, bullets, penetrating wounds.
- History of recent anesthesia and intubation.
- The history is usually acute rather than chronic.

Gender Predisposition

- Intact male dogs are more frequently involved in traumatic events, but there is no other gender predisposition for tracheal lacerations.
- No known gender predispositions are reported in cats.

Age Predisposition

- None.

Breed Predisposition

- None.

Also in this issue:

5 Peritoneal Dialysis

Owner Observations

- Dyspnea or tachypnea.
- Subcutaneous emphysema.
- Voice change.

Other Historical Considerations/Predispositions

- History of roaming or being unaccounted for when the animal could have been wounded.
- Visible injuries supporting trauma.
- Recent anesthetic event with use of endotracheal tube.

Physical Examination Findings

- Dyspnea is often observed. This can be directly related to the presence of pneumothorax, or it can be related to the level of the tracheal wound. Whereas inspiratory difficulty is expected in animals with extrathoracic tracheal obstruction caused by the laceration, expiratory distress is more likely in those with intrathoracic tracheal obstruction. However, the presence of a tracheal laceration does not necessarily indicate that an obstruction is present.
- Auscultation of the thorax may reveal dull sounds with pneumothorax, stridor if tracheal obstruction is present, or crackles if contusions are present.
- Subcutaneous emphysema.
- Coughing or gagging.
- Signs related to concurrent injuries such as rib fractures, evidence of cervical or thoracic penetrating wounds, or radiographic evidence of pulmonary contusion(s).
- Animals may be febrile resulting from the stress of the situation and the increased effort to breathe.

Laboratory Findings

- **Arterial blood gas** may show hypercapnia or hypocapnia and hypoxemia. \$
- **Complete blood count** and chemistry panels should be normal but may reflect concurrent disease. \$

Other Diagnostic Findings

- **Thoracic radiographs** may show subcutaneous emphysema, pneumomediastinum, or pneumothorax. A tracheal stripe sign may be visible at the dorsal border of the trachea, indicating a pneumomediastinum. Occasionally, especially in cats, there can be a complete rupture of the trachea, typically seen in the intrathoracic portion as a disconnection between the cranial and caudal segments. \$
- A **lateral cervical radiograph** should be included. \$
- **Bronchoscopy** may identify the site of laceration or an area of hemorrhage indicating a wound. However, the laceration is not always visible, and the risks of anesthesia and invasion of the airway must be weighed against the potential benefits of visualizing the laceration. \$\$

KEY TO COSTS

\$ indicates relative costs of any diagnostic and treatment regimens listed.

\$ costs less than \$250

\$\$ costs between \$250 and \$500

\$\$\$ costs between \$500 and \$1,000

\$\$\$\$ costs more than \$1,000

Editorial Mission:

To provide busy practitioners with concise, peer-reviewed recommendations on current treatment standards drawn from published veterinary medical literature.

This publication acknowledges that standards may vary according to individual experience and practices or regional differences. The publisher is not responsible for author errors.

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Summary of Diagnostic Criteria

- Tachypnea with restrictive breathing pattern, especially if pneumothorax or pneumomediastinum is present; obstructive breathing pattern if the trachea is occluded.
- Subcutaneous emphysema is frequently, but not always, present.
- History consistent with the possibility of trauma, injury, or recent endotracheal intubation.
- Radiographs demonstrating subcutaneous emphysema, pneumothorax or pneumomediastinum, tracheal abnormalities, or foreign bodies.
- Bronchoscopy may show the site of laceration or an area of hemorrhage indicating a wound.

Diagnostic Differentials

- Pneumothorax caused by penetrating thoracic wounds can be ruled out if no visible bruises or puncture wounds are found along the thorax or in the axillae.
- Pneumothorax resulting from fractured ribs can be ruled out if no apparent fractures are present.
- Other causes of airway obstruction, such as laryngeal injury, inhaled foreign bodies, abscesses, or neoplasms, are ruled out using historical information, radiographs, laryngoscopy, or tracheobronchoscopy.

TREATMENT RECOMMENDATIONS

Initial Treatment

- Stabilize the animal. If the animal is in respiratory distress, administer oxygen either by flow-by, mask, or oxygen cage. **\$**
 - If the patient has just sustained trauma, stabilize with IV crystalloids or colloids and pain medication if needed.
 - The first line of pain medications should be opioids: buprenorphine, 0.005–0.01 mg/kg IV q6–8h in dogs and cats, or fentanyl, 2 µg/kg IV in dogs and cats followed by a continuous infusion starting at 2 µg/kg/hr can be used and are associated with less respiratory depression than other opiates.
 - Hydromorphone, 0.05–0.1 mg/kg IV q4h in dogs and cats followed by a continuous infusion starting at 0.01 mg/kg/hr or morphine in dogs, 0.1 mg/kg IV q4h, can also be used but is associated with more side effects associated with respiratory depression.
- If the animal is in respiratory distress and pneumothorax is suspected, thoracocentesis may be necessary. **\$**
- Thoracostomy tube placement with intermittent or continuous drainage may be needed in the most

CHECKPOINT

Expert opinions may diverge on the point at which the animal should undergo surgery; however, the overall consensus is that surgery should wait until the animal is stable or continues to decline.

severely affected patients if there is evidence of a significant ongoing air leak into the pleural space. **\$\$**

- After the patient is stabilized, radiographs will give an indication of the presence and severity of pneumothorax and pneumomediastinum. **\$**
- In some patients with severe subcutaneous emphysema, it may be necessary to reduce the subcutaneous tissues by insertion of a needle and aspiration of air. This is only necessary if the skin becomes so taut that the animal is uncomfortable or breathing is restricted. **\$**
- Bronchoscopy may help the clinician determine the location of the rupture and the best course of action. However, it can be risky and unrewarding and should be considered only after the patient is stable and not improving with medical management. **\$\$**
- Depending on the severity and location of the laceration, surgery may be indicated. If extrathoracic or at the carina, surgery may be the best option to close the laceration in the initial phase of therapy. However, tracheal lacerations usually heal well on their own. Surgery as an initial therapy should only be considered if the patient is worsening. **\$\$\$\$**

Alternative/Optional Treatments/Therapy

- Conservative therapy (i.e., cage rest, oxygen supplementation, placement of a thoracic drainage tube followed by intermittent or continuous suction if needed to treat pneumothorax, sedation) often allows healing to occur, but resolution can be slow (2–10 days). **\$\$\$**
- Failure of conservative therapy is indicated by worsening dyspnea that is nonresponsive to oxygen therapy. Alternatively, surgery may be considered for stable patients with thoracostomy tubes in place, in which the air leak fails to resolve within 72 hours of supportive care. **\$\$\$\$**
- Cervical thoracic injuries may be treated by direct repair (small defects), conversion of the defect into a temporary tracheostomy site (defect less than one-third the diameter of the trachea), or resection and anastomosis (extensive injury). **\$\$\$–\$\$\$\$**
- Intrathoracic tracheal repair requires specialized anesthetic techniques and detailed knowledge of thoracic anatomy and is best performed by an experienced surgeon. **\$\$\$\$**

- The recurrent laryngeal nerves are intimately involved with the trachea and may be injured by initial trauma or surgery. Arytenoid lateralization may be needed to treat this complication. \$\$\$\$

Supportive Treatment

- Oxygen.
- Cage rest.
- Thoracostomy tube placement.
- Sedation if necessary. This can include opioids, such as buprenorphine starting at 0.005 mg/kg IV, fentanyl at 2 µg/kg IV followed by a constant infusion of 2 µg/kg/hr, acepromazine at 0.01 mg/kg IV, or medetomidine as a CRI at 1 µg/kg/hr. However, it is important to consider that these drugs can also cause respiratory depression.

Patient Monitoring

- Respiratory rate and effort: If rate or effort increases, radiographs may need to be repeated to evaluate progression of the condition.
- Pulse oximetry, arterial blood gases, continuous electrocardiography, and blood pressure monitoring.
- Degree of subcutaneous emphysema: If emphysema worsens or the animal is uncomfortable, the air may need to be aspirated.
- Volume of air leak through thoracostomy tube.

Home Management

- Cage rest for at least 2 weeks, depending on the individual patient and recheck parameters.
- Short walks with a harness rather than a neck leash.

Milestones/Recovery Time Frames

- Normalization of respiratory rate and effort within 1 to 2 days.
- Oxygen therapy is no longer needed within 1 to 2 days.
- Subcutaneous emphysema stabilizes within 1 to 2 days and resolves over 3 to 5 days.

Treatment Contraindications

- Steroids are not indicated in animals with trauma because there is little evidence supporting the beneficial effects in animals after the onset of shock and because steroids limit the clinician's options for pain management (i.e., NSAIDs cannot be used concurrently).

ON THE NEWS FRONT

- Little current information is available in veterinary literature on tracheal lacerations. Interestingly, human tracheal lacerations are frequently confirmed with bronchoscopy and may be repaired with surgery. Stabilization of the patient may include intubation or tracheostomy, and diagnostics may include radiographs or computed tomography. More information can be gained by accessing the articles in the Recommended Reading list.

PROGNOSIS

Favorable Criteria

- Responsive to oxygen.
- Rapid resolution of clinical signs.

Unfavorable Criteria

- Nonresponsive to oxygen.
- Worsening of dyspnea.

RECOMMENDED READING

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