

Tracheal Rupture in a Cat

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ABSTRACT

Endotracheal intubation is a common procedure performed during anesthesia in cats. This report describes the diagnosis and treatment of iatrogenic tracheal rupture following a dental scaling of a 4-year-old, female, neutered Scottish Fold cat. Respiratory distress, subcutaneous emphysema and excessive air under the skin in the cervical and head regions were noted on physical and radiographic examination, respectively. The tracheal rupture was successfully repaired using simple interrupted sutures.

INTRODUCTION

Various factors contributing to tracheal ruptures in cats have been discussed in the veterinary literature. Dog bites and motor vehicle accidents are the most common causes of tracheal rupture. Tracheal ruptures associated with intubation in cats have been rarely reported (Fenet et al., 2022). Intubation-related traumatic tracheal injuries can range from minor lacerations to complete ruptures, with the latter causing life-threatening respiratory distress. Partial or small ruptures may present with clinical symptoms such as subcutaneous emphysema and pneumomediastinum, which can be managed with medical treatment (Fenet et al., 2022).

Surgical and medical treatment of tracheal injuries varies depending on the size of the lesion and the severity of clinical symptoms. In the case that the tracheal injury is minor and presents with mild clinical symptoms, conservative medical therapy may be indicated. Conversely, in cases where the rupture is extensive and associated with severe clinical signs, surgical intervention is typically necessitated. The medical treatment regimen includes vigilant monitoring of respiratory rate and effort, enforcement of strict rest within a confined environment, and supplemental oxygen. Additionally, the administration

of sedatives might be considered. Subcutaneous emphysema can be detected via palpation in the cervical region. It is noteworthy that while only mild clinical signs may be evident initially in cases involving tracheal rupture, there exists a potential for acute clinical deterioration within a matter of days (White and Milner, 1995).

MATERIALS AND METHODS

This case report presents a 4-year-old, 3.5 kg neutered female Scottish Fold cat, that was referred to Kırıkkale University Veterinary Faculty Hospital because its breathing worsened after dental scaling procedure under general anesthesia. According to the information we received about the patient's previous situation, clinical examination and hematological parameters were within normal limits before the dental scaling procedure. For dental cleaning procedure, 0.2 mg/kg butorphanol (Butomidor, Richerpharma ag, Austria), 20 µ/kg medetomidine (Domitor, Orion pharma, Finland) and intermittent bolus of propofol (Propofol 2% Fresenius; Fresenius Kabi, Austria) was administered. Atipamezole (Antisedan, Orion pharma, Finland) was administered at the end of the procedure to antagonize medetomidine. It

was extubated when a cough reflex was observed. Subsequent to the procedure, the initial clinical sign observed was swelling of the cat's head and cervical region. The animal was subsequently transferred to our facility upon the onset of open-mouth breathing, an occurrence which persisted despite the provision of supplemental oxygen. In the clinical examination, crepitation was observed on palpation of the head and cervical region, and emphysema was observed in the radiographic image (Figure 1).

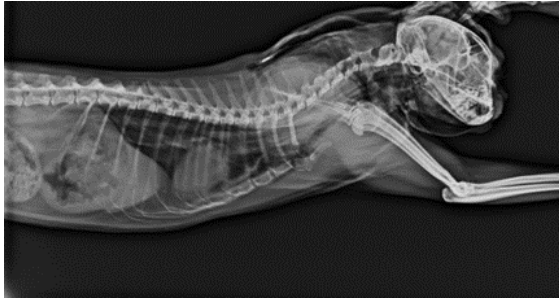


Figure 1. L/L radiographic images of subcutaneous emphysema formation in the cervical and cranial regions taken in the preoperative period.

0.2 mg/kg butorphanol (Butomidor, Richerpharma ag, Austria) and propofol (Propofol 2% Fresenius; Fresenius Kabi, Austria) were administered to the patient for the surgical procedure. Lidocaine spray (Xylocaine, AstraZeneca, India) was applied to the larynx for desensitization. Intraoral examination revealed no pathological findings in the larynx region, and the patient was easily intubated and connected to an inhalation device for isoflurane administration (Izofloran, Adeka, Turkey). After the patient's cervical region was shaved, the patient was placed in the dorsal recumbency and a ventral cervical midline incision was performed. After the trachea was exposed, the area was filled with sterile saline to determine the exact location of the tear. The endotracheal tube cuff was deflated, and positive pressure ventilation was administered while monitoring bubble egress. Following aspiration of the administered fluid, the size and location of the lesion were determined (Figure 2).



Figure 2. Intraoperative view of tracheal rupture.

The tear was identified dorsally along the trachea, extending longitudinally over an approximate length of 3 cm. As the tear was longitudinal, no tracheal ring resection

was performed; instead, it was repaired using simple interrupted sutures with 4-0 polydioxanone (PDSII; Ethicon). Subsequently, warm sterile saline was reintroduced into the area, and air bubble formation was monitored to check for leaks. Finally, the surgical site was closed using a standard technique. After the end of surgery subcutaneous air was aspirated by the needle.

RESULTS

The cat's breathing improved after the operation and recovered without any complications. On the 10th postoperative day, radiological examination revealed that most of the subcutaneous emphysema had resolved. The patient was discharged with full recovery (Figure 3a and 3b).

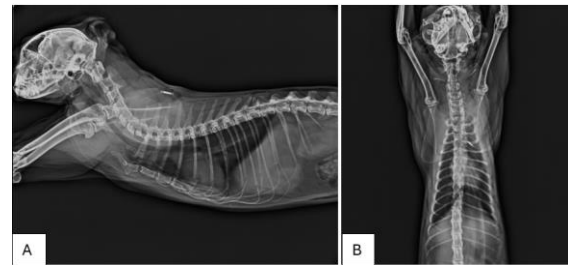


Figure 3. L/L (A) and V/D (B) radiographic images showing resorption of subcutaneous emphysema in the cervical and submandibular region on the postoperative 10th day.

DISCUSSION AND CONCLUSION

The reported rate of tracheal rupture in cats is very low. Repositioning of the tube without cuff deflation or movement of the patient with the cuff inflated are the two most common risk factors of the rupture in cats. Overinflation of the cuff, traumatic intubation with stylet, type of endotracheal tube are the other related causes (Michell et al 2000; Cabell Shannon, 2013). Tracheal rupture is most often a non-lethal injury, and medical treatment including strict cage rest and oxygen support is usually successful. Cases that do not respond to conservative treatment should be treated surgically (Bhandal and Kuzma, 2008). In this case, surgical treatment was planned due to onset of clinical symptoms shortly after extubation and worsening respiratory distress despite oxygen therapy.

It is advisable to disconnect the endotracheal tube from the anesthetic circuit when repositioning an animal during a dental procedure to avoid potential tracheal disruption due to rotation of the tube and cuff (Mitchell S. L. et al., 2000). In this case, referring veterinarian reported that the was not connected to the anesthesia device. Possible explanations of the tracheal rupture for this cat can be overinflation of the endotracheal tube cuff or excessive movement of the head during dental cleaning cause the cuff damage the trachea.

Endotracheal intubation in cats requires knowledge and experience. This procedure should only be attempted if jaw tone is lost after induction of anesthesia. If the procedures performed inappropriately it can cause a swallowing reflex and intubation will be more difficult. Cats exhibit laryngospasm if forced during intubation, making the procedure relatively challenging compared to other pets. Local anesthetic may be used to reduce the incidence of laryngospasm and facilitate endotracheal tube placement. Direct laryngoscopy is useful and allows

observation of movement of the arytenoids so that intubation attempts can be made during inspiration. Confirming tube position via direct laryngoscopy is essential. Failure to adhere to these practices can contribute to tracheal trauma and increase the risk of tracheal rupture (Hofmeister et al., 2007). According to the patient history, lidocaine was not applied to the cat's larynx before intubation, and coughing occurred upon initial insertion. This may have caused the cuff to move inside due to cough and potentially contributing to rupture risk. Transferring veterinarian mentioned that 3.5 size polyvinyl chloride (PVC) high- volume low-pressure intubation tube was used in this patient. The rigid and inflexible structure of PVC intubation tubes may have facilitated damage. Silicone rubber or armored endotracheal tubes, which tend to be less stiff, may reduce damage occurrence. However, both types of endotracheal tubes are flexible. Endotracheal tubes can be used with a stylet to increase rigidity, but should be used with caution to prevent upper airway damage (Marty-Ane et al., 1995; Mitchell et al., 2000; Hofmeister et al., 2007).

The main clinical signs of tracheal rupture include subcutaneous emphysema, dyspnea, tachypnea, anorexia, cough, lethargy, respiratory stridor, exercise intolerance, cyanosis, vomiting, dehydration, hemoptysis, depression, muffle heart sounds (Berkwitz and Berzon, 1985; Mitchell et al 2000; Bhandal and Kuzma, 2008). The diagnosis of rupture was made based on the worsening of respiration, palpable crepitus in the head and neck region, subcutaneous emphysema observed on radiographs, and the onset of open-mouth breathing after awakening from anesthesia in this case.

Tracheal rupture in cats occurs most frequently in the extrathoracic trachea (Bhandal and Kuzma, 2008), less frequently in the intrathoracic trachea, and rarely in the bronchi (White and Oakley, 2001). Radiographic findings associated with cervical or intrathoracic tracheal rupture include subcutaneous emphysema, pneumomediastinum, pneumoretroperitoneum, hyperinflated lung fields, gas-filled pseudoairway at the rupture site, focal narrowing of the tracheal lumen, and pneumothorax (Bhandal and Kuzma, 2008). When these findings were recorded in intubated cats, immediate radiography is warranted to confirm the diagnosis, and it is concluded that radiography is sufficient for diagnosis. Since the emphysema was recorded in the head and neck regions and no pneumothorax or pneumomediastinum was observed in radiologic examination, it was thought that the tear was in the cervical region.

In conclusion, it was thought that if respiratory deterioration is observed after extubation of the intubated cats, tracheal rupture should be considered, and if clinical symptoms are very severe, surgical treatment should be the first option to repair the tracheal rupture.

Conflict of Interest

The authors declare that they have no competing interests.

Authorship contributions

Concept: O.M.H., ZP, Design: O.M.H., M.B., Z.P, Data Collection or Processing: O.M.H., Z.P., Analysis or Interpretation: O.M.H., Z.P., Literature Search: O.M.N, Writing: O.M.H., M.B., Z.P

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Ethics statement

This study falls under the category of 'Clinical applications for diagnostic and therapeutic purposes,' as stated in subparagraph (k) of Article 8 of the regulation on the working procedures and principles of animal experimentation ethics committees. Therefore, approval from the Local Ethics Committee for Animal Experiments is not required.

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