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NOTE

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Unrecognized difficult airway management during anesthesia in two brachycephalic dogs with narrow cricoid cartilage

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ABSTRACT. Difficulty in airway management during anesthesia was noted in a 10-year-old, castrated, male Pekingese dog and a 13-year-old male French Bulldog. They showed strong resistance during tracheal tube insertion through the subglottic lumen. Therefore, the airway was secured by using a small endotracheal tube or supraglottic airway device. Computed tomography scan revealed a markedly narrower vertical dimension of the cricoid cartilage compared to that seen in common brachycephalic breeds. Posterior glottis was relatively more accessible for translaryngeal intubation in the present cases. Our findings showed that brachycephalic airway syndrome may be associated with narrow cricoid cartilage. To the best of our knowledge, this is the first clinical case report of airway management during anesthesia in dogs with narrow cricoid cartilage.

KEY WORDS: anesthesia, brachycephalic dog, difficult airway management, narrow cricoid cartilage

Difficult airway management is a crucial skill for clinical anesthesiologists. In human practice guideline, a difficult airway is defined as a clinical situation where a well-trained anesthesiologist experiences difficulty with facemask ventilation of upper airway, difficulty with tracheal intubation, or both [1]. In veterinary medicine, difficulty with facemask ventilation is usually encountered during anesthetic induction of brachycephalic dogs [8]. The main cause is brachycephalic airway syndrome, which occurs due to four anatomical abnormalities commonly observed in brachycephalic breeds: an elongated soft palate, stenotic nares, hypoplastic trachea, and everted laryngeal saccules. Owing to their hypoplastic trachea, most brachycephalic breeds require much smaller sized endotracheal tubes for tracheal intubation compared with other breeds with similar body weight. In veterinary clinical practice, the size of endotracheal tube is selected based on tracheal palpation finding or the internal diameter of a lateral thoracic radiographic image prior to anesthetic induction [13].

We encountered difficulty with tracheal intubation in two brachycephalic dogs with narrow cricoid cartilage, even after endotracheal tubes had been prepared based on tracheal palpation finding or the internal diameter of a lateral thoracic radiographic image. In the present cases, it was difficult to recognize these disorders prior to anesthetic induction. To the best of our knowledge, this is the first clinical case report, which describes the airway management during anesthesia of two dogs with narrow cricoid cartilage.

A 10-year-old, 6.96-kg, castrated, male Pekingese dog (dog 1), with a body condition score of 3 out of 5, was referred with a 7-days history of non-ambulatory tetraparesis that was unresponsive to treatment with firocoxib and misoprostol. The dog also received pimobendan to treat congestive heart failure after mitral valve insufficiency. The owner reported that mild respiratory distress had been present since the onset of tetraparesis. On initial examination, the dog was alert and responsive but showed the signs of respiratory distress and severe stridor. Additionally, the dog showed mild nostril stenosis (grade 2 of 4). Considering the dog's history and breed, the condition was suspected to be due to acute aggravation of brachycephalic airway syndrome with the stress of being in the hospital. The dog became calm after transient supplemental oxygen therapy thorough flow-by was started and an ice pack was applied to the neck. The dog was able to raise its head. Neurologic examination revealed non-ambulatory tetraparesis with absence of postural responses in all four limbs. Cranial nerve reflex and sensation were intact, and upper motor neuron signs were noted in all limbs. Grade 3 of 6 left systolic heart murmur was detected on thoracic auscultation, which was otherwise unremarkable. Hematologic and serum biochemical analysis indicated slightly low packed cell volume (36%; reference

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range: 37.3–61.7%) and lymphocytopenia (900 cells/µl; reference range: 1,050–5,100 cells/µl). Lateral neck radiography showed an elongated and thickened soft palate (length, 4.4 cm and the maximum thickness, 7.6 mm) and caudal movement of the hyoid apparatus during inspiration (Fig. 1). The minimum height of the nasopharynx was 5 mm. The internal tracheal diameters at the first tracheal ring and thoracic inlet were 10 mm and 7.6 mm, respectively. There was no radiographic evidence of pulmonary edema or pneumonia. To further evaluate the cause of quadriparesis, magnetic resonance imaging (MRI) assessment of the cervical spinal cord was planned.

A 22-gauge, 31-mm intravenous (IV) catheter (Supercath 5, Medikit Co., Ltd., Tokyo, Japan) was placed in a cephalic vein, and general anesthesia was induced with the IV administration of propofol. A sterile, cuffed endotracheal tube with an internal diameter of 4.5 mm (outer diameter 6.2 mm; Endotracheal tube, Teleflex medical incorporated, Wayne, PA, USA) had been prepared based on the internal diameter of a lateral thoracic radiographic image. Supplemental oxygen was administered through flow-by or facemask. A pulse oximeter was used with its probe placed on the pinna of the dog's ear. Increased respiratory effort and noise were observed after the initiation of anesthetic induction. Upper airway obstruction due to brachycephalic airway syndrome was suspected, and the larynx was immediately visualized using a laryngoscope. The dog could breathe spontaneously, with difficulty, and showed severe stridor. The main cause of respiratory distress was considered the abnormality of larynx or trachea. No macroscopic pathological changes of larynx except for everted laryngeal saccules were observed, and the laryngeal motion appeared normal in the arytenoid region. During intubation, strong resistance to tube insertion was observed after the tip of the endotracheal tube smoothly passed thorough the vocal cords. Even a smaller tube with an internal diameter 3.5 mm (outer diameter 4.9 mm) could not be intubated. At this time, the dog showed clinically relevant hypoxemia (arterial oxygen saturation using a pulse oximeter [SpO_2] <90%). A C6 size, supraglottic airway device for cats (v-gel®, Acoma medical industry Co., Ltd., Tokyo, Japan) was used in this brachycephalic dog to secure the supraglottic airway by supplying 100% oxygen and ventilation assistance. Manual ventilation assistance was feasible, although leakage was observed. The planned MRI assessment was canceled, and computed tomography (CT) scan for airway assessment was prioritized. A light plane of anesthesia was maintained with repeated IV administration of propofol during CT scanning. Pulse rate, respiratory rate, end-tidal carbon dioxide concentration, indirect mean arterial blood pressure, and SpO_2 were monitored with a multiparameter monitor (BSM-5192, Nihon Kohden Corp., Tokyo, Japan). Hypotension during anesthesia was treated with IV administration of ephedrine and atropine. Narrow cricoid cartilage and cervical disc protrusion between C2 and C3 were identified in the CT scan. The narrowest internal width of the cricoid cartilage was approximately 5 mm (Table 1). A thickened mucous surface of the cricoid cartilage was also observed (Fig. 2a–c). The dog recovered without further complications, and SpO_2 was maintained above 90% in room air.

The dog was scheduled to undergo surgery for cervical intervertebral disc disease by the ventral approach the following day. For postoperative airway management, transient tracheostomy with tracheostomy tube placement was also scheduled. The surgical management of brachycephalic airway syndrome including correction of stenotic nares, soft palate excision, and laryngeal saccules excision was planned to perform depending on the postoperative course for cervical intervertebral disk disease. The owner did not agree to a permanent tracheostomy because of the difficulties in daily care at home. During hospitalization, signs of respiratory distress, stridor, and hypoxemia were observed repeatedly, when exposed to environmental stimulation or handling during the procedure. Repeated IV administration of acepromazine (2–3 µg/kg) for sedation and oxygen administration at 400 ml/kg/min using a 5-French nasal catheter (Atom Indwelling Feeding Tube, Atom medical Co., Ltd., Tokyo, Japan) to avoid hypoxemia were required.

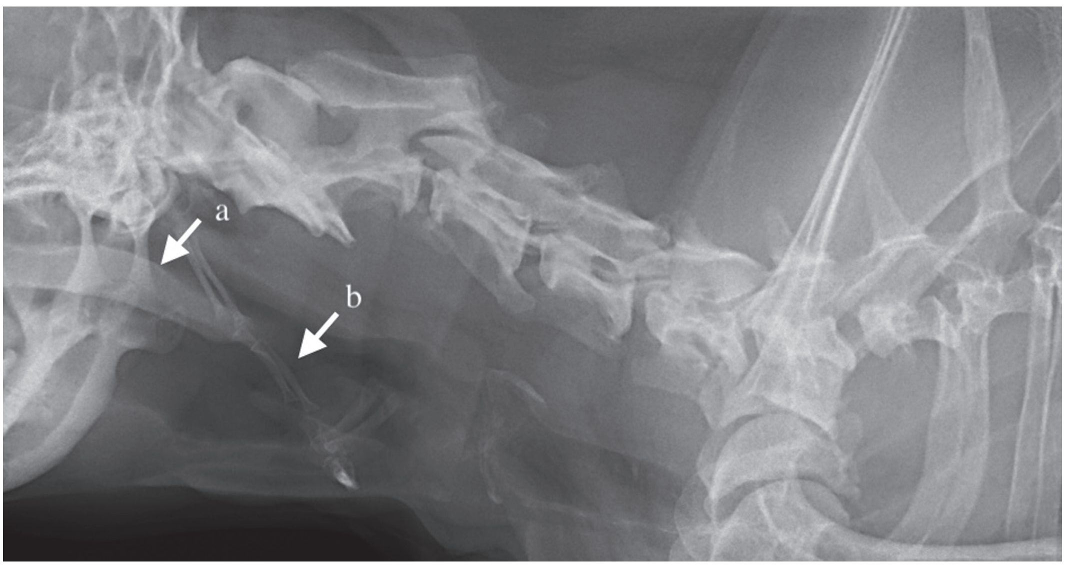

Fig. 1. Lateral neck radiograph of dog 1 during inspiration. An elongated and thickened soft palate was observed (a). In addition, caudal movement of the hyoid apparatus occurred (b) because of strong inspiratory effort.

Table 1. Measurements taken from the CT scan images to evaluate the degree of cricoid narrowing in dog 1 and dog 2

Part	Measuremetns	Dog 1	Dog 2
Rostral level of cricoid cartilage	Height (cm)	1.69	1.92
	Maximum width (cm)	0.49	0.77
	Narrow width (cm)	N/A	0.40
	Height to width ratio	3.45	2.49–4.80
	TSA to BW ratio of cricoid cartilage	0.10	0.07
	TSA to BW ratio of airway	0.04	0.03
Ring level of cricoid cartilage	Height (cm)	1.62	1.94
	Maximum width (cm)	0.81	0.81
	Narrow width (cm)	N/A	0.49
	Height to width ratio	2.00	2.40–3.96
	TSA to BW ratio of cricoid cartilage	0.15	0.08
	TSA to BW ratio of airway	0.07	0.04

Rostral level of cricoid cartilage: the level of Fig. 2b in dog 1 and Fig. 2e in dog 2. Ring level of cricoid cartilage: the level of Fig. 2c in dog 1 and Fig. 2f in dog 2. TSA: transverse sectional area (cm^2), BW: body weight (kg), N/A: not applicable.

A cuffed endotracheal tube (internal diameter 3.0 mm), two non-cuffed endotracheal tubes (internal diameter 2.0 mm and 2.5 mm), and an 8-French tube exchanger (Airway Exchange Catheter, Cook Medical Japan, Tokyo, Japan) were prepared for airway management during surgery. To secure the surgical field of ventral slot and avoid complications in airway management during surgery, orotracheal intubation was preferred, although transient tracheostomy was scheduled. Anesthesia was induced with IV administration of propofol, and successful intubation in posterior glottis was achieved with the tube of internal diameter 3.0 mm (outer diameter 4.2 mm). The tube was softened in a warming cabinet and well lubricated with lidocaine jelly before intubation. Anesthesia was maintained with continuous infusion of propofol and oxygen during MRI, which was performed to exclude the presence of any other cervical nerve disorder. The infusion rates of propofol to maintain anesthesia ranged from 0.2 to 0.25 mg/kg/min. Volume controlled intermittent positive pressure ventilation was started (Assist, Acoma Medical Industry Co., Ltd., Tokyo, Japan). The initial ventilator settings were as follows: respiratory rate 14 breaths/min, tidal volume 100 ml, and inspiratory-to-expiratory ratio 1:4. Pulse rate, respiratory rate, end-tidal carbon dioxide concentration, indirect mean arterial blood pressure, and SpO_2 were monitored using the multiparameter monitor. During anesthesia maintenance for MRI, the dog developed bradycardia (lowest heart rate, 46 beats/min) without relevant hypotension (lowest mean arterial pressure, 67 mmHg). Because bradycardia increases the diastolic filling interval and worsens mitral regurgitation [9], heart rate was titrated to approximately 100 beats/min by IV administration of atropine. No additional complications occurred during anesthesia for MRI.

MRI indicated cervical disc protrusion between C2 and C3. The dog was positioned in dorsal recumbency for surgical preparation and then transferred to the operation theater, where lactated ringer solution was administered at 5 ml/kg/hr. Surgical anesthesia was maintained with continuous infusion of propofol and remifentanil. Infusion of remifentanil for intraoperative analgesia ranged from 10 to 40 µg/kg/hr. Additionally, IV administration of cefazolin at 20 mg/kg was performed. Intermittent positive pressure ventilation was continued, and fraction of inspired oxygen was set at 0.6. Rectal temperature, lead II electrocardiogram, pulse rate, respiratory rate, end-tidal carbon dioxide concentration, direct arterial blood pressure obtained from a 22-gauge catheter placed at the pedal artery, and SpO_2 were monitored with the multiparameter monitor. Body temperature was maintained throughout surgery using a forced warm air device. The infusion rates of propofol to maintain surgical anesthesia ranged from 0.15 to 0.2 mg/kg/min. During surgery, hypotension was treated with a single IV administration of ephedrine or phenylephrine and continuous infusion of dopamine. A short-term rapid infusion of lactated ringer solution (10 ml/kg for 30 min) was also required to maintain blood pressure when increased bleeding occurred transiently. Before cessation of anesthesia, transient tracheostomy with 4.5-mm tracheostomy tube placement was performed. No additional complications occurred during the surgical procedure, and the total duration of the operation was 200 min. During recovery from anesthesia, IV acepromazine was administered at 30 µg/kg to prevent anxiety and agitation. SpO_2 was maintained around 90% under spontaneous breathing at room air and at least 97% with oxygen supplementation. The patient was admitted to the intensive care unit and administered IV remifentanil at 5 µg/kg/hr for the first 18 hr after surgery, IV acepromazine ranging from 2 to 5 µg/kg as needed, IV prednisolone sodium succinate at 1 mg/kg every 24 hr, and IV cefazoline at 20 mg/kg every 8 hr. During hospitalization, tracheostomy tube care, including cleaning and suctioning of secretions and nebulization with saline and acetylcysteine were performed as needed. Additionally, the tracheostomy tube was replaced once a day. Complications of tracheostomy, including massive subcutaneous emphysema and mediastinal emphysema associated with either tracheostomy tube dislodgement or obstruction, and suspected aspiration pneumonia with right middle lobe atelectasis were observed. The symptoms of pneumonia improved after starting chest tapping and administration of enrofloxacin. The tracheostomy tube was removed 6 days post-operation, and the dog was discharged 9 days post-operation. Quadriparesis improved gradually, although the signs of respiratory distress and severe stridor were observed under stressful conditions.

A 13-year-old, 14.5-kg, male French Bulldog (dog 2), with body condition score of 4 out of 5, was referred for evaluation of

Fig. 2. Cricoid stenosis confirmed on computed tomography images. Neck computed tomography (CT) images in the transverse plane at the cricoid level in dog 1 (a) and dog 2 (d) and in the dorsal plane at the laryngeal level in dog 1 (b, c) and dog 2 (e, f). The shape of the cricoid cartilage seemed vertically ovoid (b, c) or gourd (e, f). In both dogs, the rostral level of cricoid cartilage (b, e) was narrowest compared to the ring level of cricoid cartilage (c, f).

a mass on the left side of the neck. Respiratory rate was 36 breaths/min. Mild inspiratory effort and stridor were observed. Based on the dog’s breed, it was suspected to be mild brachycephalic airway syndrome. The dog showed mild nostril stenosis (grade 2 of 4). The mass was firm, freely mobile, measured 2.3 cm × 5.0 cm, and was palpable in the left submandibular region. No other abnormalities were observed in a physical examination, hematologic and serum biochemical analysis, and thoracic radiographs. A normal left submandibular lymph node was seen on the ventral aspect of the mass by ultrasonography. Fine needle aspirates from the mass contained clusters of epithelial cells showing anisokaryosis. A tentative diagnosis of left mandibular gland tumor was made.

Immediately after the ultrasonography, the dog showed marked tachypnea, inspiratory effort, stridor, and cyanosis. Acute aggravation of brachycephalic airway syndrome due to the stress of handling or hyperthermia was suspected. Oxygen therapy through flow-by was started. Moreover, 22-gauge IV cannulation was performed. Propofol was administered intravenously at 2 mg/kg for sedation, and laryngeal deployment using a laryngoscope was performed. After oxygen supplementation and laryngeal deployment, cyanosis improved rapidly. Rectal temperature was 39.9°C. Ice packs were applied to the dog's neck, axilla, and inner thigh. IV acepromazine at 20 µg/kg, IV prednisolone sodium succinate at 1 mg/kg, and subcutaneous famotidine at 10 mg were administered. A 6-French nasal catheter was placed, and oxygen therapy at 200 ml/kg/min was continued. However, respiratory distress did not improve after laryngeal deployment, and the dog showed severe stridor. The main cause of respiratory distress was considered to be the abnormality of larynx or trachea. Additionally, aspiration of viscous fluids from the nasopharynx or esophagus into the trachea was observed. Therefore, endotracheal intubation for airway management under general anesthesia and CT scan for pre-therapeutic assessment of the upper airway and the mass on the neck were planned. Before anesthetic induction, the laryngeal motion appeared normal in the arytenoid region. There were no macroscopic pathological changes of larynx under laryngeal deployment except for everted laryngeal saccules.

After airway suctioning, anesthesia was induced with IV propofol. Orotracheal intubation with a cuffed, sterile endotracheal tube prepared based on thoracic radiographic image (internal diameter of 5.0 mm; outer diameter 6.8 mm) was attempted but failed, because strong resistance was encountered after the tip of the tube passed thorough the vocal cords. The internal tracheal diameter assessed from thoracic radiograph at the thoracic inlet was 9.4 mm. Then, another cuffed endotracheal tube (internal diameter of 4.5 mm; outer diameter 6.2 mm) was inserted. However, it barely went through the posterior glottis. Finally, tracheal intubation was secured using another cuffed endotracheal tube (internal diameter of 3.5 mm; outer diameter 4.9 mm) to avoid tissue irritation and swelling. Anesthesia was maintained with oxygen and isoflurane during the CT scan. Intermittent positive pressure ventilation (volume controlled) was started. The initial ventilator settings were as follows: respiratory rate 14 breaths/min, tidal volume 110 ml, and inspiratory-to-expiratory ratio 1:3. Pulse rate, respiratory rate, end-tidal carbon dioxide and isoflurane concentration, indirect mean arterial blood pressure, and SpO_2 were monitored with the multiparameter monitor. During the CT scan, lactated ringer solution was administered at 10 ml/kg/hr, and hypotension was treated by IV phenylephrine and ephedrine at 2 µg/kg and 50 µg/kg, respectively. Narrow cricoid cartilage (Fig. 2d–f) and left mandibular gland mass were identified in the CT scan along with an elongated and thickened soft palate (length, 5.7 cm and the maximum thickness, 10 mm). The minimum height of nasopharynx was 3 mm, but it seemed to be affected by the prone position and tracheal tube. The internal tracheal diameter at the first tracheal ring was 10 mm.

Early surgical management for mandibular gland mass was considered essential. The dog was expected to require tracheostomy, either temporary or permanent, after sialoadenectomy, regardless of surgical management of the brachycephalic airway syndrome. The dog was overweight and had flabby cervical skin. Therefore, the maintenance of temporary tracheostomy tube was considered to be difficult. The surgical procedure for a permanent tracheostoma and cervical skin fold excision was planned after the CT scan. Cefazoline was administered intravenously at 20 mg/kg, and IV buprenorphine and medetomidine were administered at 20 µg/kg and 1 µg/kg, respectively for perioperative analgesia. Surgical anesthesia was maintained with 21–60% oxygen, and infusion of propofol ranging from 0.15 to 0.3 mg/kg/min was continued. During tracheostomy, spontaneous breathing was maintained. No additional complications occurred during the anesthesia; the total duration of the operation was 81 min. SpO_2 was maintained over 95% at room air after extubation.

After surgery, mucous accumulation in the tracheal lumen was removed with a moistened gauze sponge or suction tip as needed. Nebulization with saline for tracheostoma humidification was also performed three times a day. Major complications of permanent tracheostoma, including asphyxiation from mucus obstruction or skin fold occlusion, and wound dehiscence, were not observed during the hospital stay. The dog was anesthetized to excise the left mandibular gland mass 6 days after the first surgery. No additional complications occurred during this surgical anesthesia except for a transient hypotension treated with an IV infusion of atropine and dopamine. Finally, the dog was discharged 2 days after the second surgery.

To the best of our knowledge, this is the first clinical case report, which describes an unrecognized difficulty in airway management during anesthesia of two dogs with narrow cricoid cartilage. Both dogs showed inspiratory effort and stridor before anesthesia induction, but the main cause of these symptoms was considered to be brachycephalic airway syndrome. Clinical sings of this syndrome include exercise intolerance, stertor, stridor, cough, dyspnea, tachypnea, gagging, regurgitation, vomiting, and syncope [12]. We surmised that the clinical sign of narrowing airway was hidden by brachycephalic airway syndrome in both dogs. Therefore, difficulty in airway management was initially unrecognized in both dogs and was identified only when tracheal intubation was attempted.

According to the CT scans, the narrowest airway was at the rostral level of cricoid cartilage in both dogs (Fig. 2a and 2d). It may be affected by the presence or absence of tracheal intubation and breathing cycle phase, although the cricoid cartilage has a rigid structure [7]. In dog 1, the trachea could not be intubated and the breathing phase was undistinguishable during the CT scan because of spontaneous breathing, while in dog 2, the trachea was intubated and the CT scan was performed in expiratory phase. Rutherford *et al.* [12] reported that the cricoid cartilage and trachea in brachycephalic dogs are narrower than those in mesaticephalic dogs. Pugs and French Bulldogs have more vertically ovoid cricoid cartilage than Jack Russell Terriers and Labradors [12]. The mean height-to-width ratio in the ring level of cricoid cartilage is 1.41 in Boston Terriers, 1.62 in Pugs, 1.67 in French Bulldogs, 1.42 in English Bulldogs, 1.46 in Jack Russell Terriers, and 1.47 in Labradors [12]. In the present report, the ratio of height-to-width ratio in the ring level of cricoid cartilage was 2.00 in dog 1 and ranged 2.40 to 3.96 in dog 2 (Table 1). Both dogs in our case had vertically narrower cricoid cartilage compared to common brachycephalic breeds, although it is not clear whether this was congenital or acquired. Additionally, the rostral level of cricoid cartilage was markedly narrower than the ring level of the cricoid cartilage in both dogs (Table 1). We surmise that the narrow cricoid cartilage, especially at rostral level, limited the thickness of endotracheal tube that could be used to intubate in both dogs. Since the airway from central to ventral region was narrowest at the cricoid level in both dogs, the posterior glottis was considered to be relatively accessible for translaryngeal intubation in both cases.

In the present cases, the shape of the cricoid cartilage at the rostral level seemed vertically ovoid in dog 1 and gourd in dog 2. Additonally, a thickened mucous membrane was observed in the ventral region of airway at the cricoid cartilage of both dogs. These changes might be induced by attempts of tracheal intubation. In humans, anaphylaxis induced severe oropharyngeal angioedema and bronchospasm following propofol administration has been reported [14]. In the present cases, no other symptoms including flushing of skin, systemic vasodilation, and tachycardia were observed. The thickened mucous membrane caused half the transverse sectional area to body weight ratio of airway, compared to that of cricoid cartilage in both dogs (Table 1). Moreover, in both dogs, the ventral aspect of the glottis was obstructed by an everted laryngeal saccule. These narrow parts of the airway may result in increased airway resistance because of the onset of turbulent flow. We speculate the increased airway resistance was associated with exacerbation of respiratory distress in both dogs.

Subglottic stenosis is a risk factor for difficult airway management under general anesthesia in humans [1]. The initial airway management techniques commonly used in patients with subglottic stenosis are jet ventilation, use of small endotracheal tube or supraglottic airway device, facemask ventilation, and bronchoscopy for spontaneous breathing [6]. In dogs, the emergency techniques for difficult airway management are use of small endotracheal tube or supraglottic airway device, jet ventilation, and tracheostomy. Iizuka *et al.* [5] reported the use of a supraglottic airway device for successful airway management in a dog with glottic stenosis. In dog 1 during the CT scan, airway was managed with a supraglottic airway device. Depending on the severity of the airway stenosis, the supraglottic airway device might be useful in airway management for short-term anesthesia in dogs with subglottic stenosis, and it is useful for securing the airway in the dogs with brachycephalic airway syndrome [10]. In the present cases, airway management was also done by insertion of a small endotracheal tube thorough posterior glottis. To avoid hypoxemia, jet ventilation can be applied via a small catheter (e.g. airway exchange catheter) inserted into the trachea thorough the glottis. Surgical tracheostomy is considered the last resort for the rescue of difficult airway.

In humans, subglottic stenosis is classified as congenital and acquired. Congenital subglottic stenosis is caused by malformation of the cricoid cartilage [4], while the causes of acquired subglottic stenosis include infection, trauma, and inhalation burns. Additionally, the most common cause of acquired subglottic stenosis is complications associated with translaryngeal intubation [2]. Causal factors of post intubation stenosis are use of excessively large tube and hyperinflated cuff, and prolonged intubation [2]. In the present report, dog 1 had a history of anesthesia for castration although whether tracheal intubation was performed was unknown, and dog 2 had no history of anesthesia. Subglottic stenosis with severe narrowing airway in human can be treated by dilated with a balloon, or a surgical procedure to expand the airway through telescope or an incision in the neck [3]. However, tracheostomy might be needed before these reconstructive surgeries can take place [3]. In the present cases, temporary tracheostomy was performed in dog 1 after cervical spinal surgery and permanent tracheostomy was performed in dog 2 before sialoadenectomy. The prognosis of the subglottic stenosis and its treatment in the dogs could not be determined, but both dogs were discharged from the hospital. The placement of laryngeal stent can be an alternative therapy for laryngeal stenosis in dogs [11].

We encountered cases of unrecognized difficult tracheal intubation in brachycephalic dogs with narrow cricoid cartilage even after using endotracheal tubes prepared based on tracheal palpation findings or the internal diameter of a lateral thoracic radiographic image. The narrowest airway was the rostral level of cricoid cartilage, which seemed to be limiting the thickness of endotracheal tube that could be intubated in both dogs. Posterior glottis was relatively more accessible airway for translaryngeal intubation in the present dogs. Brachycephalic airway syndrome might be associated with narrow cricoid cartilage and thickened mucous membrane that could lead to difficulty in tracheal intubation.

POTENRIAL CONFLICTS OF INTEREST. The authors have nothing to disclose.

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