

## Nasopharyngeal Stenosis in a Cat Treated by Dilatation with Balloon

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### Abstract

Presentation of an adult cat with a one year clinical history of rales, inspiratory dyspnea and exercise intolerance. Under suspicion of a nasopharyngeal disease we decide to do in first place an axial computerized tomography that does not come up with a diagnosis, so we do a retroflexion endoscopy that shows a nasopharyngeal stenosis. Due to the stenosis location we did dilatation with balloon. There were needed a total of three, one week and two weeks apart, followed by a treatment with steroids to control the inflammation and delay and reduce the scar retraction. After 18 months the cat remains asymptomatic.

**Keywords:** Cat; Nasopharynx; Stenosis; Crackles; Dyspnea; Upper Airway; Retroflexed Endoscopy; Balloon Dilatation

### Introduction

Nasopharyngeal stenosis (NFS) is a narrowing of the nasopharyngeal channel through scar tissue that forms a membrane and partially obstructs the passage of air. Its etiology seems secondary to inflammatory processes. The most frequent symptoms are rales, inspiratory dyspnea, dysphagia and exercise intolerance [1,2]. The definitive diagnosis is carried out by means of endoscopy in retroflexion, fluoroscopy or computed tomography (CT). The proposed treatments include surgical resection [3], surgery with mucosal flap advance [4], balloon dilatation [5,8] and stent placement [9,11]. A diagnosed case of NFS is described by flexible endoscope and treated by balloon dilation obtaining a complete resolution of clinical signs.

### Clinical Case

#### History and physical examination

Cat, male, Sphynx, two years and 5 kg, with inspiratory reinforcement, rales and intolerance to exercise. Adopted at one year of age, he had conjunctivitis, nasal discharge, sneezing, dyspnea and respiratory noises. With antibiotic and anti-inflammatory it partially improved, but it maintained dyspnea and rales; He was diagnosed with chronic rhinitis and given corticosteroids and antibiotics intermittently. It is progressively getting worse. Vaccinated, wormed, sterilized, fed a high-end diet, indoor, lives with three cats without signs of respiratory disease. The list of problems includes inspiratory dyspnea, rales and exercise intolerance.

#### Diagnosis and treatment

Lateral radiographs are made of the thoracic cavity, head and neck. In the nasopharyngeal region, a line of soft tissue opacity dorsal to the soft palate is observed, probably elongation of the same, without dorsal angulation (Figure 1). Blood tests are normal and negative retrovirus tests (Table 1). It is proposed to perform other imaging techniques and analysis of respiratory pathogens. Initially, a sequential CT is performed with 1 mm and 1.5 mm cuts between cuts (Figure 2). A 3<sup>rd</sup> generation helical CT is used. The report describes mild thickening of the nasal mucosa and elongated soft palate. They recommend partial resection of the soft palate. The cultures, bacterial and fungal, of respiratory exudates are negative. The patient is anesthetized with premedication with dexmedetomidine 0.01 mg/kg i.m., midazolam 0.1 mg/kg i.m. and methadone 0.2 mg/kg i.m., is induced with propofol at a dose of 1 mg/kg (dose-effect), intubation and maintenance, with isoflurane and oxygen. Once it is observed that the soft palate does not collapse the airway rostral rhinoscopy with rigid endoscope and endoscopy with a flexible endoscope of 4.9 mm external diameter and 600 mm in length to assess the nasopharynx

is performed (Figure 3 and 4). The right nostril presents finer and more angular turbinates than normal compatible with a severe ancient inflammatory process and an NFS is observed by a membrane with a 1mm hole, near the caudal edge of the soft palate, in an eccentric position (Figure 5).

Hematology		
Red blood cells	7.75 mill	(5.5 - 10)
Hemoglobin	11.3 gr/dL	(8 - 14)
Hematocrit	35,7%	(24 - 45)
VCM	46 fL	(39 - 55)
HCM	14.5 pg	(12 - 18)
CHCM	31.5 g/dL	(30 - 36)
Platelets	364 miles	(175 - 700)
Leukocytes	12.8 miles	(5.5 - 130)
Granulocytes	60.5%	(40 - 75)
Lymphocytes	37.0%	(20 - 55)
Monocytes	2.5%	(1 - 4)
Eosinophils	1.4%	(1 - 10)
Total protein	7.2 gr/dL	(5.5 - 7.2)
Glucose	158 mg/dL	(75 - 200)
Creatinine	1.2 mg/dL	(0.8 - 2.0)
BUN	26.1 U/l	(8 - 33)
ALP	26 U/L	(25 - 110)
GPT	80 U/L	(10 - 80)
FeLV	Negative	
FIV	Negative	

Table 1: Patient analytics.



Figure 1: LL radiograph of the head showing a dorsal membrane on the palate (white arrow) and an elongation of the soft palate.

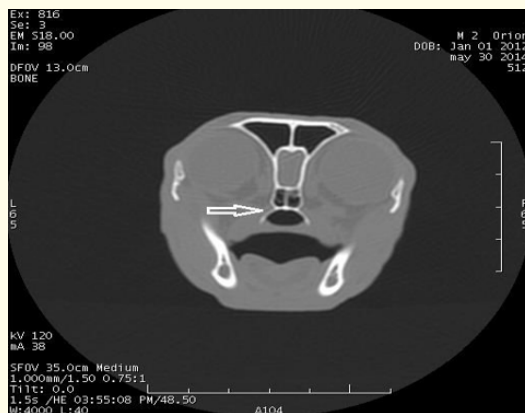


Figure 2: Image of one of the cuts made with CT in which a normal diameter nasopharynx area is observed (arrow).



Figure 3: Rostral rhinoscopy with rigid endoscope.

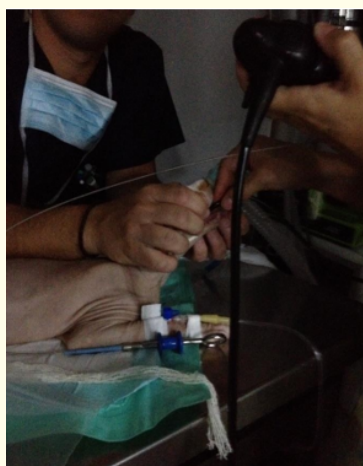
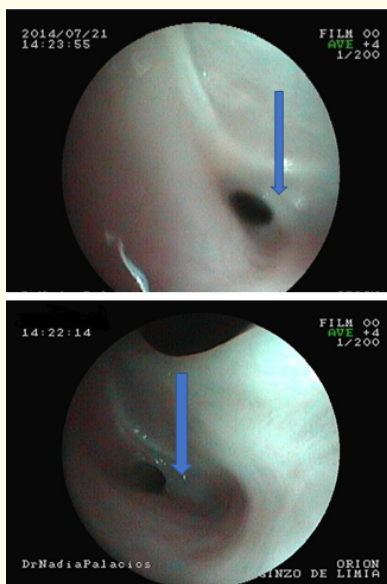
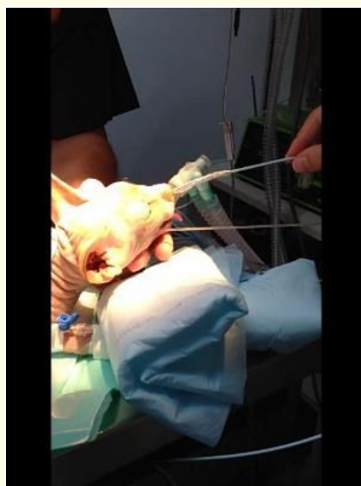


Figure 4: Endoscopy of the nasopharyngeal region with flexible endoscope.

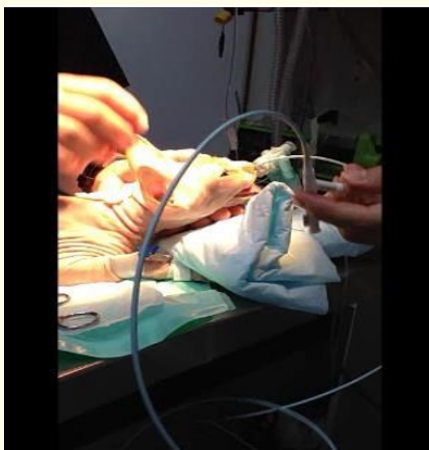


**Figure 5:** Endoscopic image of membrane narrowing at the level of the nasopharynx.

Exudate samples are taken to identify other respiratory pathogens. In the same procedure, a dilator balloon catheter with a diameter of 18 mm, a balloon length of 40 mm and a catheter length of 210 mm is inserted through the nasal opening to the nasopharynx, passing through the stenotic area where the balloon is placed and dilated with physiological serum (Figure 6 and 7). Two dilations were performed keeping the balloon in a fixed position for 1 minute, under endoscopic control, achieving a diameter of 5 mm, size considered acceptable in cats [15]. Methylprednisolone (Urbason® 4 mg) 1 mg/ kg BID/7 days and after 1 mg/kg/PO SID/7 days is administered to prevent healing. Caregivers are warned that it may need more dilations. For economic reasons, other respiratory pathogens are not evaluated. It is indicated revision to the week and to the two weeks.

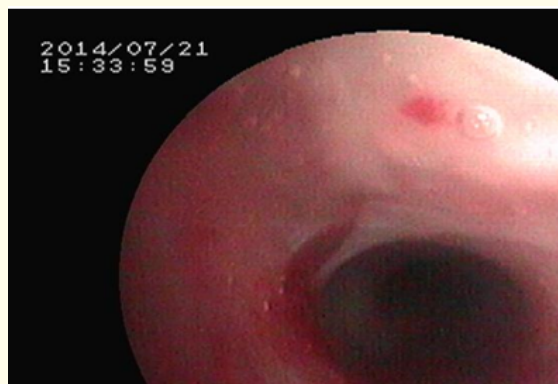


**Figure 6:** Introduction of the balloon catheter through the nasal orifice.



**Figure 7:** Once the balloon is placed in the nasopharynx, dilation is performed.

Immediately disappears the rattle, dyspnoea and is more active, but a week already has respiratory sounds. The nasopharynx has been stenosed reducing the light to 1 mm. We performed a single balloon dilation, holding the balloon in a fixed position for 1 minute, reaching a final diameter of 5 mm. After two weeks, the area was narrowed with soft fibrous tissue and granulation tissue in the right dorsal area. We performed another balloon dilatation obtaining a diameter of 8 mm (Figure 8). It is administered later prednisolone drops (Estilsona® drops) due to difficulty in administering tablets, 2 mg/kg/SID/7d and 1 mg/kg/SID/7d.



**Figure 8:** Appearance of the nasopharynx after two dilations with balloon in the same session.

After 19 months he has not shown signs of respiratory disease, has a good quality of life and a high level of activity. Caregivers report mild breath sounds when asleep. For economic reasons, endoscopy has not been repeated.

## Discussion

The respiratory pattern characteristic of upper respiratory disease is inspiratory reinforcement. The rattle is due to the passage of air through obstructed airways. The exact cause of the NFS is not known, inflammatory processes secondary to infections of the upper respiratory tract may be involved, as it seems to be our case, irritation due to vomiting or regurgitation, or congenital defects with malformation in the opening of the choanae.

A scar tissue is formed in the form of a membrane of variable width [12], caudal to the choanae, which reduces the diameter and obstructs the passage of air. It appears in cats of any race, age or sex. It is not a frequent pathology, it appears in 6% of cats with upper

respiratory tract disease [13], but it must be included in the differential diagnosis when they present rales and even nausea or dysphagia. Other signs are intolerance to exercise, dysphonia, nasal discharge and, in severe cases, open mouth breathing.

They do not respond to conventional treatments with antibiotics and/or anti-inflammatories.

The differential diagnosis includes infectious and non-infectious pathologies (Table 2) [1,2,12].

Infections	<p><b>Viral infections:</b> Feline herpesvirus type 1 Feline calicivirus</p>
	<p><b>Bacterial infections:</b> Mycoplasma spp, Chlamydia psittaci Pseudomonas spp, Pasteurella spp, Bordetella spp, Mycobacterium spp, Escherichia coli, Streptococcus spp, Staphylococcus spp, Corynebacterium spp</p>
	<p><b>Fungal infections:</b> Cryptococcus neoformans Cryptococcus gatti Saprofitos Aspergillus spp</p>
Neoplasms	<p>Lymphoma Adenocarcinoma Linfosarcoma Sarcoma</p>
Inflammatory: ENF Oronasal Fistulas	<p>Chronic lymphoplasmacytic rhinitis Allergic rhinitis Nasopharyngeal polyps Chronic idiopathic rhinosinusitis</p>
Foreign bodies	<p>Grass, sand, etc.</p>
Trauma	<p>Falls, fights, abuses, etc.</p>
Anatomical anomalies	<p>Congenital:</p> <ul style="list-style-type: none"> <li>• Cleft palate</li> <li>• Brachiocephalic syndrome</li> <li>• Cochrane atresia</li> </ul> <p>Acquired:</p> <p>NFS Oronasal fistulas</p>

**Table 2:** Differential diagnosis of the main nasopharyngeal pathologies in the cat.

It is important to obtain a complete history, examine anatomically related structures, rule out concurrent diseases, FeLV-IVF and respiratory pathogens and perform imaging tests. Radiography and fluoroscopy, in lateral projection of the head, may show a narrowing at the level of the nasopharyngeal region, a membrane line and/or dorsal angulation of the soft palate (Figure 9). The CT allows to assess the entire airway, locate the lesion, the extent of it, define the diameter of the stenosis and the length of the membrane. It is probable that in our case the resolution or the cuts were not adequate. The separation between cuts must be minimal, since the membrane can be very thin and go unnoticed [12] (Figure 10). To visualize the nasopharynx directly, a flexible endoscope with a bidirectional tip of 3 - 5 mm [2,16] is needed, which retroreflects 180o [2,14]. It is inserted through the oral cavity and past the soft palate, allowing to see the caudal part of the choanae. Direct visualization using a dental mirror has also been described, removing the soft palate, although it is not always easy and the rhinography with iodinated contrast 7.



**Figure 9:** LL radiograph of a cat showing a dorsal membrane to the soft palate that obstructs the passage of air (black arrow).  
Courtesy of Ayavet Veterinary Clinic.



**Figure 10 :** CT image showing a caudal narrowing at the level of the nasopharynx. Courtesy of Diagnosfera.

The first treatment described consisted of surgical resection, accessing through an incision in the soft palate [3]. Due to the high rate of recurrences, alternative techniques such as surgical resection and/or balloon dilation followed by the placement of a braided stainless steel permanent stent [9] were sought, the membrane broken with forceps and then the surface of the nasopharynx reconstructed us-

ing a flap mucosal advancement [4], balloon dilatation [5-8], placement of a metal stent expandable by surgery [9] or by balloon [10,12] and dilatation followed by the placement of a temporary silicone stent that is removed at 3 - 4 weeks [11]. In all cases, corticosteroids are administered later to delay healing. Practically all treatments have been successful in the short or long term, but some techniques are only individual cases that present a high rate of recurrence and the placement of a stent can cause the formation of granulation tissue or the presence of swallowing movements or nausea if it is placed very caudal [1,4]. At present, it is recommended if the stenosis is cranial or recurrent, place a stent and if it is very caudal, perform serial dilatations with the balloon to avoid problems of swallowing or nausea [8,10,11]. The placement of a stent does not present recurrences (it avoids re-stenosis) but it does have a high complication rate [17].

Balloon dilation is an easy technique to perform and little invasive. It can be done under real-time visualization with endoscopy or fluoroscopy. It has two drawbacks: it can lead to restenosis in a few days, weeks or months that require further dilatation and there is no protocol on the size of the balloon to be used, the objective of expansion of the nasopharynx, the dilations per session, the interval between sessions or adjuvant treatments [8]. No relationship has been found with the type or dose of corticosteroid used, duration of treatment, diameter of the balloon or protocol of dilatations regarding the degree of recurrence but it has been found that more than 50% of treated cats required two or more dilatations [5-8]. We used an endoscopic revision protocol every week, regardless of clinical signs, and three dilations were necessary, despite using an 18 mm balloon, to achieve a sufficient hole size and treatment with methylprednisolone or prednisolone for 2 weeks. Recurrences stopped when a diameter of 8mm was obtained, which was the maximum to achieve when the edges of the tear line coincided with the basal wall of the nasopharynx. We chose this treatment because it is not very invasive, it is within our reach and it is recommended to be very caudal stenosis. The result, as described, is satisfactory in the long term.

## Conclusion

In the presence of inspiratory dyspnea and rales, the upper respiratory tract including the nasopharynx should be investigated and several diagnostic imaging techniques should be used if clinical signs persist and the cause has not been found. Owners should be informed that balloon dilation presents recurrences and several interventions are necessary. More studies are needed to establish a protocol of action for the treatment of this disease.

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