Nasal Hydropulsion: A Novel Tumor Biopsy Technique

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ABSTRACT

Intranasal tumors of dogs and cats pose a diagnostic and therapeutic challenge for small animal practitioners. Multiple nasal biopsy techniques have been described in the past. This report describes a simplified flushing technique to biopsy and debulk nasal tumors, which often also results in immediate clinical relief for the patient. Based on the results of this retrospective study, the authors recommend high-pressure saline hydropulsion as a minimally invasive diagnostic, and potentially therapeutic, technique for nasal tumors in dogs and cats. (J Am Anim Hosp Assoc 2011; 47:312–316. DOI 10.5326/JAAHA-MS-5608)

Introduction

Intranasal neoplasia accounts for approximately 1–2% of all tumors in dogs and cats. An accurate diagnosis and treatment can be challenging; therefore, an alternate biopsy method is desirable.1 Clinical signs associated with intranasal tumors often include nasal obstruction (uni- or bilateral lack of airflow, stertorous breathing, interrupted sleeping), nasal discharge, sneezing, reverse sneezing, epistaxis, pain, and/or nasal deformation.1,2 Several imaging techniques have been used to diagnose intranasal tumors, including radiography, computed tomography (CT), and MRI.1,2 Rhinoscopy with associated nasal biopsy/histopathology is considered the most definitive method to confirm a diagnosis of a nasal neoplasia, but biopsies obtained under rhinoscopic guidance are only 83% successful in identifying tumor type.3 Due to their location, nasal tumors can be difficult to biopsy despite the fact that several techniques have been previously described. These techniques include diagnostic nasal flushing, punch biopsy, catheter techniques, fine-needle aspiration, sinus trephination, and rhino-scopic-assisted mucosal biopsies.1–8 A successful diagnosis may depend on tissue volume obtained.1 A relatively noninvasive technique to obtain a larger portion of tissue may help improve diagnostic accuracy. In this report, the authors describe a hydropulsion method of forceful nasal flushing, which is minimally invasive and obtains a large sample for biopsy. The authors believe that this hydropulsion method will allow for the collection of a larger volume of nasal tissue and improve clinical signs while awaiting histology results that will help guide treatment options.

Materials and Methods

Medical records of all rhinoscopies performed at Wheat Ridge Veterinary Specialists between Jan 2006 and April 2008 were included. Patients with suspected intranasal tumors, based on clinical signs or CT findings, were rhinoscopically evaluated and biopsied with the hydropulsion technique, a traditional biopsy method, or a combination of the two.

Patients were premedicated (butorphanol†, glycopyrrolate‡), anesthetized (diazepam§, propofol¶), intubated with an endotracheal tube with a well-inflated cuff, and maintained on inhalant anesthesia (isoflurane‖).12 A CT scan was recommended in all cases, but was only performed on 6/41 patients.

To perform the nasal hydropulsion, patients were positioned in sternal recumbency on a wet table with clean towels placed...
under the mouth to collect any tissue fragments following hydro-
pulsion (Figure 1). Rhinoscopy of the anterior and posterior nasal
cavities using both a multipurpose rigid telescope7 and a flexible
bronchoscope8 was performed as previously described.12 Once
a nasal mass was confirmed, a Poole suction tip was inserted into
the orad esophageal opening, and the cuff on the endotracheal tube
was checked to ensure a tight seal. Hydropulsion was performed by
digitally occluding one nostril. A 20–60 cc regular luer tip syringe
containing room temperature sterile saline was inserted around the
contralateral alar fold and into the anterior nasal cavity (Figure 2).
Whenever possible, and depending on the size of the patient,
a 60 cc syringe was used. Between 20 and 60 mL of saline was
forcefully infused into the nasal cavity. The goal was to infuse
60 mL in <2 sec to generate high pressures in the nasal cavity
(i.e., “hydropulsion”). This process was repeated in the contralateral
nostril. The entire procedure was repeated between one and three
times in each nostril to obtain tissue samples. The entire nasal
cavity was re-evaluated via rhinoscopy, and hydropulsion was re-
peated until no additional tissue could be obtained. If no sample
was obtained, the procedure was considered unsuccessful. Hydropulsed tissue was collected from the towel on the wet table, the oral
cavity, or rhinoscopically from the nasopharynx. Hydropulsion
was attempted in all patients, but when unsuccessful, an endo-
scopic pinch biopsy or needle biopsy was performed immedi-
ately after the hydropulsion attempt. Samples were preserved in
10% buffered formalin for histopathologic evaluation. All tissue
samples were evaluated by the same board-certified veterinary
pathologist (B.P.).

Following hydropulsion, the oropharynx and trachea (rostral
to the endotracheal tube cuff) were suctioned using either the
endoscope or Poole suction catheter. Care was also taken to suction
the cervical esophagus whenever possible. A damp gauze sponge
was used to swab any remaining fluid from the oropharynx. Patients
were recovered routinely and monitored for possible complications
prior to discharge. Figure 3 is an example of a typical amount of
hydropulsed tissue.

Most (35/41) patients were discharged the same day the
procedure was performed. Exercise restriction for 1 wk was advised
to prevent further sneezing and dislodging of any blood clots.
All patients were routinely discharged with piroxicam9 (0.3 mg/kg
per os q 24 hr) while awaiting histopathology results and treat-
ment option decisions.9–11

Results

Between Jan 2006 and April 2008, 41 cases met the inclusion
criteria and were included in this report. A total of 29 dogs and 12
cats were identified, with a mean age of 10.25 yr (cats) and 10.62 yr
(dogs). Clinical signs prior to rhinoscopy included obstructed
breathing/snoring, nasal discharge (including epistaxis), and
occasional coughing.

Despite an older population, anesthesia was tolerated well
by all patients. Rhinoscopy identified an obstructive tissue mass
in all cases. A diagnostic sample was successfully dislodged from
the nasal cavity in 37/41 nasal tumors (90.2% overall success rate).
A sudden decrease in resistance was often felt as tissue broke free and was hydropulsed through the nasopharynx. Hydropulsion was unsuccessful in 4/29 dogs (13.79%) and in 1/12 cats (8.9%). Nasal tumors diagnosed in included patients were: adenocarcinoma (n=13); other carcinomas (n=8); lymphoma (n=6); osteosarcoma (n=3); other sarcomas (n=10); and spindle cell tumor (n=1). In the four dogs in which hydropulsion was unsuccessful, endoscopic pinch biopsies (n=3) or needle biopsies (n=1, a mutilobulated osteosarcoma) were obtained (Table 1). A histopathologic diagnosis was made from these biopsies in these four cases where hydropulsion failed.

Immediate relief of nasal obstruction was not an outcome that was initially evaluated; however, in approximately one-third of the evaluated patients, nasal flow was considered improved based on nasal stethoscopic auscultation performed pre- and posthydropulsion. Two cats and three dogs had hydropulsion performed multiple times to alleviate recurring clinical signs of obstructive nasal breathing and epistaxis. In one cat, three hydropulsions were performed over a 24 mo period from Jan 2004 to Feb 2006 (only one hydropulsion was included in this report).

Minor postoperative complications included sneezing, reverse sneezing, and mild postoperative epistaxis. In three cases, submucosal or retrobulbar swelling was noted immediately following hydropulsion (Figure 4). One dose of furosemide (2 mg/kg IV) was administered to each of these patients. Clinically, these three patients appeared to recover without difficulty between 6 hr and 12 hr postprocedurally. No anesthetic complications were encountered.

Discussion
The success rate for definitive diagnosis in this study (90.2%) was higher than previous reports of nasal flushing and endoscopic pinch biopsy techniques, which range from 50% to 83%.2,4 In the patients where hydropulsion was successful, a large quantity of tissue was dislodged for histopathologic review. Although a limited number of samples were available, it did not appear that the gross rhinoscopic appearance of the mass (e.g., smooth bordered, lobulated, polypoid) appeared to influence the success of the hydropulsion. This technique was successful in obtaining tissue from a variety of tumor types.

Based on these results, the authors encourage hydropulsion attempts in all cases of nasal airflow obstruction, especially where a nasal tumor is suspected. This technique could also be useful in the removal of non-neoplastic secretions and flushing nasal foreign bodies.

This technique is designed to push tissue through and out of the nasopharynx; therefore, packing the oropharynx with gauze, as previously reported, is not necessary.6 As described herein, careful suctioning and cleaning of the proximal trachea, oropharynx, and nasopharynx is necessary following this procedure to prevent possible fluid aspiration and to collect all tissue fragments.

The pressures produced by forceful hydropulsion were successful in dislodging tissue from the nasal cavity. As might be expected, minor postoperative bleeding was not uncommon. In four cases, this bleeding was more moderate, requiring a slightly longer anesthesia to achieve hemostasis. Diagnostic evaluation of cases presenting with epistaxis should include a minimum database, blood pressure measurement, platelet evaluation, and coagulation studies prior to rhinoscopy.13 Other common postoperative observations that were noted included sneezing and reverse sneezing, which were most likely in response to irritation caused by the endoscope and/or the fluid/tissue on the nasopharyngeal mucosal surfaces. In the few cases (n=3) where tissue was not easily dislodged by the forceful hydropulsion, fluid appeared to accumulate submucosally because mucosal swelling was evident upon visual inspection of the nasopharynx. All of these cases resulted in successful tissue dislodgement via hydropulsion, and no further complications were documented in these patients.

Although not performed in all included cases, a CT scan of the nasal cavity is recommended before all hydropulsion procedures to evaluate the cribriform plate. Only six patients in this study had a CT performed prior to the procedure. The decision to not perform a CT was based on financial constraints of the owner. No postoperative neurologic complications (e.g., seizures) were encountered in this study population, but this would be a concern if the cribriform plate was compromised by a mass. Potential
neurologic complications were discussed with all owners before hydropulsion was attempted.

In this study, approximately one-third of the patients experienced immediate relief of their nasal obstruction following the hydropulsion. It is the authors’ opinion that many animals with nasal tumors are euthanized due to the owners’ concern regarding poor quality of life secondary to persistent obstructive breathing. By alleviating this clinical concern, the authors suggest that many owners would be willing to live with the other clinical signs associated with nasal tumors.

The use of piroxicam postprocedurally was chosen for both its chemotherapy and anti-inflammatory properties.9–11

### TABLE 1

<table>
<thead>
<tr>
<th>Case number</th>
<th>Signalment</th>
<th>Method of biopsy</th>
<th>Histologic diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9 yr old FS Labrador retriever</td>
<td>Hydropulsion</td>
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</tr>
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<td>10 yr old FS Persian mixed-breed</td>
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<td>41</td>
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</tr>
</tbody>
</table>

DLH, domestic longhaired; DMH, domestic mediumhaired; DSH, domestic shorthaired; MN, male neutered; FS, female spayed
Conclusion

Several surgical and nonsurgical techniques have previously been described to obtain biopsies of intranasal masses.1–6 Hydropulsion allows for the collection of large biopsy samples and the potential relief of nasal airflow obstruction. The authors also found that this technique can be repeated multiple times to debulk tissue, which specifically addresses one reason why animals with nasal tumors are commonly euthanized. Future prospective studies should be conducted to further evaluate the therapeutic utility of this method to relieve nasal obstruction in patients with nasal tumors.

FOOTNOTES

a Butophanol; Bedford Laboratories, Bedford, OH
b Glycopyrrolate; Baxter Healthcare Corporation, Deerfield, IL
c Diazepam; Watson Laboratories, Corona, CA
d Propofol; Bedford Laboratories, Bedford, OH
e Isoflurane; Hospira, Inc., Lake Forest, IL
f Karl Storz Multi-Purpose Rigid Telescope, Germany
g Karl Storz 5mm flexible canine bronchoscope; Karl Storz GmbH & Co. KG, Tutlingen Germany
h Piroxicam; Pfizer, New York, NY
i Furosemide; Boehringer Ingelheim, Ingelheim, Germany

REFERENCES