

# CHARACTERIZATION OF NORWICH TERRIER UPPER AIRWAY SYNDROME (NTUAS): PRELIMINARY RESULTS

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# CHARACTERIZATION OF NORWICH TERRIER UPPER AIRWAY SYNDROME (NTUAS): PRELIMINARY RESULTS

A serious upper airway syndrome in Norwich Terriers (NTs) has been long recognized among breeders, but only recently reported by veterinarians. Variable signs, from snoring and intermittent breathing noises to severe breathing difficulty, collapse and asphyxiation are manifest. It has been proposed that the upper airway changes are because NTs are brachycephalic (compressed muzzles), but the muzzle conformation in NTs is not markedly brachycephalic and does not warrant the severity of changes seen in the larynx.

## **Purpose of the study:**

To undertake a detailed characterization of the upper airway in a large (150) cross-section of Norwich terriers, in different age groups, within USA and Canada. We will be using questionnaires, physical examinations and upper airway examination (video-laryngoscopy & tracheoscopy). Twenty-five of these Norwicks will additionally undergo CT and nasal resistance measurements, and compared to 25 Norfolk terriers, 25 brachycephalic dogs, and 25 dogs with normal muzzle length. The results will be used to develop a detailed NTUAS score that all veterinarians can use.

## **Methods used:**

Each dog owner undergoes a detailed online questionnaire via REDCap online clinical database = these dogs are called “recruited”. Dogs that become “enrolled” undergo blood work, chest X-rays, physical examination and a standardized upper airway examination by video-endoscopy. This is coordinated by Michigan State University (MSU) and these tests can be done at the veterinary colleges at MSU, Texas A&M, University of California Davis, or University of Pennsylvania. The CT and nasal pressure measurements can only be performed at MSU. All of the results are entered into REDCap by each institutional investigator. The study should finish enrollment by the end of summer of 2017

**Preliminary results:**

Early clinical results are presented – 61 NT of proposed 175 dogs (150 NT, 25 NF) have been enrolled. (The results from the 25 brachycephalics and the 25 normal muzzle dogs are funded by a different study, but will be compared to this study) No nasal pressure or CT results are reported at this stage.

All dogs had normal nostrils and nasopharynx. Although we are not reporting CT results, we have not noted any nasal obstruction in the CTs we have performed. Main anatomic abnormalities consisted of:

- mildly elongated soft palates (39/61)
- redundant dorsal pharyngeal tissue with obliteration of the piriform recesses (41/61)
- abnormal laryngeal mucosa (37/61)
- abnormal cuneiform (25/61) and/or corniculate (18/61) processes
- partially or fully everted ventricles (sacculae) (48/61), and
- abnormal keyhole shape to the lower larynx (53/61).

Additionally, 8/61 dogs were thought to have decreased laryngeal function upon inspiration. Examination under microscope was performed on 22 samples of excised ventricles (sacculae). A wide variety of inflammation was reported, with no consistent pattern in cell types.

Quite a large number of dogs, 35/61, showed periodontal disease with enlarged and hyperemic tonsils.

Treatments so far have included: sacculotomy, resection of redundant folds, midline ventral approach to larynx with resection of tissue, and permanent tracheostomy. All these approaches have had successful outcomes, but numbers are still small and long-term follow-up is limited.

**Preliminary Conclusions:**

The nasal passages and nostrils appear normal in Norwich terriers. High numbers of NTs appear to have laryngeal abnormalities, and these are present even with no or mild respiratory signs. Dogs compensate remarkably well for the severity of laryngeal changes seen. The abnormalities documented so far are not consistent with brachycephalism, but rather appear to be a primary laryngeal abnormality with redundant mucosal folds and a narrowed infraglottic lumen.