Diagnostic Efficiency of Ultrasound-Guided Aspiration of Medial Retropharyngeal Lymph Node and Predictive Computed Tomography Characteristics in Dogs
Kim C, Oblak ML, Nykamp S
Department of Clinical Studies – Ontario Veterinary College, University of Guelph

Introduction
The medial retropharyngeal lymph nodes (MRPLN) are considered the collecting site of all lymphatic drainage of the head. Staging of these lymph nodes in cancers of the head and neck is important to establish treatment plans and to determine prognosis. As MRPLNs are not palpable unless there are significant increases in size or changes in consistency, ultrasound-guided aspiration (USGA) is frequently used in veterinary medicine for sample collection from the MRPLN. However, the true diagnostic yield of USGA has not been studied. Computed tomography (CT) is the preferred imaging modality for evaluation of the head and neck cancers and regional lymph nodes. CT evaluation of MRPLN is subjective to individual interpretation as the CT characteristics of MRPLN of the dog are not well documented.

• The purpose of this study was to assess the diagnostic yield of USGA of the MRPLN and report CT factors predictive of whether a diagnostic sample would be obtained. A secondary objective was to report CT size reference ranges for cytologically confirmed normal MRPLNs in dogs and compare it to the parameters of reactive MRPLNs.
• We hypothesized that:
  1. The characteristics of MRPLNs on CT image are predictive of obtaining diagnostic samples
  2. There will be a significant variation in CT size between normal and reactive MRPLNs.
  3. Age and weight have impacts on the sizes of non-metastatic MRPLNs.

Materials and Methods
Case selection
• Retrospective cross-sectional design performed at a single institute.
• Medical records of the Ontario Veterinary College Health Centre Small Animal Clinic reviewed between September 2011 and March 2017
  - Inclusion: Dogs with head or neck malignancy, USGA and cytology of the MRPLN.
• Primary tumor characteristics:
  - Diagnosis (cytology/histology)
  - Location (oral, nasal cavity, thyroid, others)
  - Side (left, right, mid)
• Cytopathological results of MRPLN:
  - Diagnostic vs Non-diagnostic
  - Benign vs Metastasis
  - Normal vs Reactive
• CT measurements were performed by DACVR.
  - (Rostral, Middle, Caudal) x (Height and Width) x Length (by thickness and caliper)
  - Volume of lymph node = \(\frac{4}{3}\pi \times \text{length} \times \text{rostral width} \times \text{rostral height}
  - Ratios of the rostral, middle, and caudal lymph node widths to the lymph node length
  - Heterogeneity
  - Margins
  - Surrounding fat
  - Presence of hilus

• Statistical analysis: Logistic regression, ANCOVA & Pearson’s correlation coefficient. P<0.05 considered significant

Results
• Signalment
  - Sixty-nine dogs met the inclusion criteria and consisted of 25 breeds
  - The median body weight was 27 kg (range 3.9-54 kg)
  - The median age was 10.5 years (range 1-15 years)
  - There was 1 sexually intact female, 31 spayed females, 2 intact males and 35 castrated males
• Primary tumor characteristics
  - Diagnosis (Figure 2) and location (Figure 3) did not affect likelihood of diagnostic sample
• Cytopathology results
  - A total of 120 MRPLNs (Left n=62, Right n=58)
  - Diagnostic in 57 MRPLNs (47.5%) vs Non-diagnostic in 63 MRPLNs (52.5%)
  - Benign in 51 MRPLNs (B) vs Metastasis in 6 MRPLNs (10.5%) (Table 1)
  - Normal in 37 MRPLNs vs Reactive in 13 MRPLNs
• Statistical analysis
  1. Only one of the independent variables (rostral height) made a statistically significant contribution to the overall diagnostic yield with an odds ratio of 1.116 (95% confidence interval 1.031-1.216).
  2. When cytologically normal MRPLNs were compared to cytologically reactive MRPLNs using ANCOVA, no differences were observed in all investigated CT parameters.
  3. Pearson’s correlation coefficient demonstrated that age had a statistically significant negative linear correlation with middle height and width in both L+R and L MRPLNs; weight had a significant positive linear correlations with volume and caudal width and length (by thickness and caliper) in both sides, however, with length (by thickness) alone in left side and with volume in right side.

Discussion
• The diagnostic yield of USGA of MRPLNs in the current study was low.
  - Only rostral height was positively associated with increasing chance of obtaining diagnostic samples. However, it is possible that other variables did not reach statistical significance due to type II error.
  - There were no significant differences found in CT characteristics between normal and reactive MRPLNs, which might indicate that CT may not be sensitive to detect benign changes of the MRPLNs.
  - Age had a negative linear correlation with the size of MRPLNs, whereas weight had a positive linear correlation with the size. However, the differences between MRPLN sizes relative to age and body weight are not likely to be clinically important due to measurement error, and various possible combinations of age and body weight.

Table 1: Details of Metastatic Lymph Nodes and The Associated Primary Tumors

<table>
<thead>
<tr>
<th>Patient</th>
<th>Tumor diagnosis</th>
<th>Tumor location</th>
<th>Location of primary tumor</th>
<th>Side of MRPLN metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Melanoma</td>
<td>Oral</td>
<td>Middle</td>
<td>Left</td>
</tr>
<tr>
<td>2</td>
<td>Sarcoma</td>
<td>Oral</td>
<td>Middle</td>
<td>Left</td>
</tr>
<tr>
<td>3</td>
<td>Sarcoma</td>
<td>Nasal cavity</td>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td>4</td>
<td>Others</td>
<td>Nasal cavity</td>
<td>Right</td>
<td>Right</td>
</tr>
<tr>
<td>5</td>
<td>Carcinoma</td>
<td>Thyroid</td>
<td>Right</td>
<td>Left</td>
</tr>
</tbody>
</table>

Figure 1: Representative CT image window width, 350; window level, 40 of the head of a dog indicating electronic caliper tool placement for measurement of MRPLN height + width (A) and length (B)

Figure 2: Tumor Distribution

Figure 3: Tumor location