Introduction

- Unilateral vocal cord paralysis (UVCP) is a structural abnormality typically occurring secondary to dysfunction of the recurrent laryngeal nerve.
- Loss of vertical alignment between the arytenoids and the vocal cords has been suspected to result in poorer vocal outcomes.
- Evidence of this has previously been limited to computer simulations and cadaveric assessments.
- However, recently a study of 23 patients at our institution suggested that preoperative CT assessment of height discrepancy was associated with poorer VHI-10 scores post-operatively.
- However, there is little knowledge a priori regarding what the normal variation in VC height discrepancy may be in the general population.

Working Hypothesis

- We hypothesise that arytenoid height discrepancy is highly suggestive of pathology and occurs less often in normal patients than in those with UVCP.
- We measure the degree of height discrepancy in a cohort of normal patients who underwent fine slice CT of the neck for other reasons.

Methods

Study Design
- Retrospective review performed of prospectively collected data.
- Consecutive patients who underwent fine slice (<1mm slices) CT imaging from skull base to mediastinum at Westmead Hospital, Sydney, Australia between January 2016-December 2018.
- Patients were excluded if there were any documented concerns of their voice, or confirmation of any vocal cord or head or neck surgery.
- A comparison group of the initial 23 patients with confirmed UVCP in the study previously published in Head and Neck was used.
- Assessment of height discrepancy was performed by a head and neck radiologist, and was defined as the distance between the arytenoid height in millimetres when compared to known horizontal landmarks of the superior arch of cricoid cartilage and inferior margin of the thyroid cartilage.

Statistical Analysis
- Categorical data was reported as percentages and raw numbers.
- Continuous parametric data was reported as means with standard deviations.
- Categorical variables were compared using the chi-squared test and continuous variables compared using a student’s unpaired t-test.

Results

Demographics (Table 1)
- 44 patients (50% female) with mean age 57.6 ± 14.8 years were included in the normal group.
- Indication for scan included preoperative planning for C-spine surgery; neck pain with no pathology, spinal lesions and globus pharyngeal symptoms.
- The UVCP group comprised of 23 patients (43.4% female) with a mean age of 52.3 ± 14.9 years.
- No statistically significant difference was identified between the two groups regarding sex (Pearson’s Chi-square 0.26, OR 1.30, p=0.61) or age (t-test, mean difference = 5.21 years, p=0.18).

Vertical Height Discrepancy
- None of the patients were found to have a height discrepancy greater than 2mm in the normal group (mean discrepancy 2.00mm ± 0.00).
- Patients with UVCP had a mean discrepancy of 2.39mm ± 0.72. When assessing only patients who required revision surgery in this cohort, the mean discrepancy was found to be 3.50mm ± 1.00.
- A statistically significant difference in height discrepancy was found between the two groups (t-test, mean difference = 0.39mm, p<0.001). An even greater difference was observed when comparing normal patients to those with UVCP requiring revision surgery (t-test, mean difference = 1.34mm, p<0.0001).

Tables:

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of patients (n)</th>
<th>Mean difference (mm)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>44</td>
<td>0.39</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>UVP</td>
<td>23</td>
<td>0.26</td>
<td>p=0.61</td>
</tr>
</tbody>
</table>

Discussion

- This study demonstrates that that no arytenoid vertical height discrepancy exists in 44 normal patients without concerns in their voice or history of previous head and neck surgery.
- This suggests that any vertical height discrepancy identified on coronal CT slices likely represents a pathological process, such as UVCP as defined in our previous study Vocal cord height asymmetry appears to be a significant predictor for reduced improvement in VHI scores.
- The results also suggest that CT has enough accuracy to identify a clinically significant height discrepancy threshold that results in poorer acoustic consequences.
- With increasing sensitivity of CT for cord pathology causing dysphonia, there is potential that this modality may currently be underutilised in clinical practice.
- The authors believe that detecting this difference may have implications on the timing of intervention, type of repair (such as an open approach which may be better suited to adjust for height discrepancy over an endoscopic approach), the addition of arytenoid adduction or use of harder materials that exert greater pressure.