Diagnostic Challenge of Sulcus Vocalis Made Easier

Nupur Kapoor Nerurkar, Harsh Karan Gupta, Ajay Eknath Shedge

ABSTRACT

Objectives: To introduce a simple diagnostic test performed with white light laryngoscopy for the diagnosis of sulcus vocalis.

Materials and methods: This is a retrospective observational study. A total of 14 patients with voice-related complaints and a phonatory gap on examination were included. Obvious structural and neuromuscular glottic pathologies were excluded. Phonatory gap was measured using white light rigid laryngoscopy with the technique described here. Findings were then correlated with stroboscopy.

Results: All 14 patients (10 U/L and 4 B/L), observed to have an asymmetric phonatory gap on white light rigid laryngoscopy, were diagnosed with sulcus vocalis.

Conclusion: An asymmetric phonatory gap, as seen on white light laryngoscopy and measured with the simple technique mentioned here, should make the laryngologist suspect a sulcus vocalis. However, the diagnosis needs to be confirmed by stroboscopy.

Keywords: Phonatory gap, Stroboscopy, Sulcus.

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INTRODUCTION

Sulcus vocalis has been defined as a groove or a depression on the vibratory surface of the vocal fold wherein the epithelium is tethered onto the subepithelial tissues, superficial lamina propria (SLP), or deeper. Ford et al have divided sulcus vocalis into three types depending upon the depth of migration of the epithelium. Type I, also known as physiological sulcus, is a longitudinal depression of the epithelium into the SLP but not down to the vocal ligament. Hence, the mucosal wave pattern is not altered and the patient is relatively asymptomatic. Type II (sulcus vergeture) is a full-length depression extending down to the vocal ligament or deeper. Type III, on the contrary, is often deep pit-like, focal, and deeper indentation of epithelium with loss of deeper layers of lamina propria and often muscle (Fig. 1). This leads to loss of pliability and tissue volume; the otherwise smooth movement of the epithelial cover over the body is altered. The patients present with hoarseness and more often symptoms of glottal insufficiency like vocal fatigue, inability to talk loudly, effortful speech with odynophonia, and occasionally a high-pitched voice.

Due to this depression within the vocal fold, a phonatory gap is commonly observed. This phonatory gap has been described as a ‘spindle-shaped glottis’. Even though sulci are often bilateral, the depth often varies. In our experience, the phonatory gaps associated with sulci are more often asymmetrical or ‘D’ shaped.

Most sulci remain undiagnosed because of lack of objective diagnostic criteria, clinician awareness, and occasionally subclinical symptoms. Our study aims to discuss a new diagnostic parameter, which also lends objectivity, to help the budding laryngologist pick-up a sulcus vocalis.

MATERIALS AND METHODS

This is a retrospective observational study of prospectively maintained database. In our voice clinic, 257 patients presented, from November 2014 to April 2015, with complaints of hoarseness and/or vocal fatigue and/or reduced range of speech. All these patients underwent white light rigid laryngoscopy and stroboscopy.
evaluation for an accurate anatomical and physiological
assessment of the vocal folds.

Inclusion criterion was patients who had a phonatory
gap on white light laryngoscopy examination.

Exclusion criteria were: (1) Any obvious glottic
lesion like vocal fold cyst, polyp, nodule, papilloma,
contact granuloma, leukoplakia, suspected vocal fold
malignancy, (2) Patients with U/L or B/L vocal fold
paralysis/paresis and (3) Patients with history of prior
vocal fold surgery.

Still images of the recorded evaluations of white
light rigid laryngoscopy with the vocal folds in the fully
adducted position were studied (using Scopydoc version
7.0.2). Printouts were taken of these still images. A vertical
line (L) was then drawn through the interarytenoid area
(in adducted vocal folds) to the anterior commissure.
The length of this line L was calculated and was divided
into 10 equal parts or ‘units.’ The distance of the medial
edges of both the vocal folds, at the point of maximum
deviation, from the line L was calculated in terms of the
‘units’ mentioned earlier. The distances were assigned
values ‘Rd’ and ‘Ld’ for right and left vocal folds,
respectively (Figs 2A to C). These findings were then
correlated with the stroboscopy findings to evaluate the
presence or absence of a sulcus vocalis. The association
of a sulcus with Rd and Ld was analyzed.

RESULTS

Of the total 257 patients screened, 14 met the inclusion
criterion and were assessed in detail. There were 12 males
and 2 females. All 14 patients who had a phonatory gap
on white light rigid laryngoscopy were diagnosed with
sulcus vocalis on stroboscopy examination. The sulcus
vocalis encountered were bilateral in 4 patients and
unilateral in 10 patients (right-sided in 8 and left-sided
in 2). Hence, a total of 18 vocal folds had sulcus vocalis.

On calculating the Rd and Ld, it was seen that none
of the 14 patients had a symmetric phonatory gap. The
presence of a phonatory gap, i.e. Rd or Ld, correlated
with the side of the sulcus vocalis (Figs 3 and 4). Also,
greater the Rd or Ld, deeper was the sulcus on that side,
as confirmed on stroboscopy. The average phonatory
gap of all the affected vocal folds (i.e. 18) was 0.485 units
(Table 1).
DISCUSSION

The classic findings in sulcus vocalis were noted by Hirano et al.\(^4\) way back in 1990. However, sulcus vocalis remains one of the most commonly missed glottic pathologies. As observed by Poels et al.,\(^9\) Dailey and Zeitels\(^10\) noted that sulcus vocalis was the single most unidentified benign glottic entity.\(^10\) These undiagnosed sulcus vocalis are usually reported as ‘phonatory gap’ which is a sign and not a diagnosis.

An asymmetric phonatory gap on white light laryngoscopy, with no obvious structural (cyst, polyp, nodule, papilloma, contact granuloma, leukoplakia, suspected vocal fold malignancy) or neuromuscular (vocal fold paresis/palsy) glottic pathology should make the laryngologist suspect a sulcus vocalis. The final diagnosis, however, should be made with stroboscopy.

REFERENCES


Table 1:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Rd (units)</th>
<th>Ld (units)</th>
<th>Strobe findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.67</td>
<td>—</td>
<td>Right-sided grade III sulcus</td>
</tr>
<tr>
<td>2</td>
<td>0.50</td>
<td>—</td>
<td>Right-sided grade III sulcus</td>
</tr>
<tr>
<td>3</td>
<td>0.53</td>
<td>0.79</td>
<td>B/L sulcus; left deeper than right</td>
</tr>
<tr>
<td>4</td>
<td>0.50</td>
<td>0.75</td>
<td>B/L sulcus; left deeper than right</td>
</tr>
<tr>
<td>5</td>
<td>0.60</td>
<td>0.20</td>
<td>B/L sulcus; right deeper than left</td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>0.42</td>
<td>Left-sided grade II sulcus</td>
</tr>
<tr>
<td>7</td>
<td>0.52</td>
<td>—</td>
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</tr>
<tr>
<td>8</td>
<td>0.50</td>
<td>—</td>
<td>Right-sided grade III sulcus</td>
</tr>
<tr>
<td>9</td>
<td>0.28</td>
<td>—</td>
<td>Right-sided grade I sulcus</td>
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<tr>
<td>10</td>
<td>0.26</td>
<td>—</td>
<td>Right-sided grade I sulcus</td>
</tr>
<tr>
<td>11</td>
<td>0.18</td>
<td>0.54</td>
<td>B/L sulcus; left deeper than right</td>
</tr>
<tr>
<td>12</td>
<td>—</td>
<td>0.57</td>
<td>Left-sided grade III sulcus</td>
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<tr>
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<td>—</td>
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</tr>
<tr>
<td>14</td>
<td>0.50</td>
<td>—</td>
<td>Right-sided grade III sulcus</td>
</tr>
</tbody>
</table>

CONCLUSION

The usual causes of a phonatory gap, without other structural or neuromuscular glottic pathologies, include sulcus vocalis, vocal fold atrophy and, less frequently, chronic laryngitis.\(^11\) Vocal fold atrophy (presbyphonia) more often leads to a symmetrical phonatory gap.\(^12\) Sulcus vocalis, on the contrary, causes an asymmetric or ‘D’ shaped phonatory gap, as observed in our study.

Our study introduces a new parameter to help in diagnosing sulcus vocalis using rigid white light laryngoscopy, which is one of the most easily available diagnostic facilities. An angled rigid telescope with recording facility is available in most peripheral institutes. The use of white light laryngoscopy, as mentioned in this study, also lends objectivity to an otherwise subjective diagnosis. Prior studies have mentioned the use of digitized stroboscopes for determining the phonatory gap, which may not be widely available.\(^13,14\) As per our study, the gap can be measured with the help of a printout of a recorded white light image and a ruler. On analysis, if the phonatory gap is asymmetric, then the diagnosis of sulcus vocalis should be suspected, which should then be confirmed on stroboscopy. Hence, we suggest that asymmetric phonatory gaps on white light laryngoscopy be given the provisional diagnosis of ‘suspected sulcus vocalis’ and not ‘phonatory gap.’