Chapter 28
VSK in the assessment of functional voice disorders
Agata Szkielkowska & Beata Miaśkiewicz

Abstract
Qualitative assessment of kymograms and OQ values were obtained from VSK examination of nearly 600 patients with hyper- and hypofunctional dysphonia (HyPo & HyPer). In HyPer dysphonia the OQ was significantly lower compared to HyPo dysphonia. These results make VSK in our opinion suitable for monitoring progress of voice treatment.

Keywords: Videostrobokymography, hyperfunctional dysphonia, hypofunctional dysphonia

Introduction
In this chapter we concentrate on the applications of VSK to functional dysphonia.

Material and Methods
The clinical material included 577 patients (10 normal controls and 567 with functional dysphonia). Among the dysphonic patients, 420 presented with hyperfunction and 147 with hypofunction. All were examined at the Audiology and Phoniatrics Clinic of the Institute of Physiology and Pathology of Hearing in Kajetany, Warsaw, Poland. All recordings were made with the EndoSTROB DX Xion 327 unit (Xion GmbH Berlin, Germany, UE) during sustained phonation of the vowel /i/. The three line kymograms were based on the four-second recording and represented the anterior, middle, and posterior glottis locations.

Results
In patients with functional dysphonias the OQ values were significantly different depending on the type of dysphonia. In hyperfunction, the OQ was significantly lower compared to hypofunctional dysphonia. Table 1 shows the derived values for the three groups.

Hypofunctional dysphonia (HyPo)
LVS images are shown in Figures 1-1 and 1-2. In the patient with hypofunctional dysphonia, the OQ values were similar in all three segments of the vocal folds (VF) and higher compared to the control group (Figures 1-3, 1-4, and 1-5).

Videostrobokymogram for the anterior segment in the case of hypofunctional dysphonia showed slight left-right asymmetry with phase shift and shortened closed phase. At the middle portion of the glottis left-right asymmetry, phase shift, and shortened closed phase continued.

At the posterior third of the VF, phase asymmetry and slightly reduced vibratory amplitude on both sides were noted. There was observed shortened closed phase as well.
Table 1. Mean values of OQ in patient with the two types of functional dysphonia and the control group. OQ are derived from the anterior, middle, and posterior thirds of the VF.

<table>
<thead>
<tr>
<th></th>
<th>Anterior</th>
<th>Min, Max</th>
<th>Middle</th>
<th>Min, Max</th>
<th>Posterior</th>
<th>Min, Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>0.56</td>
<td>0.41, 0.68</td>
<td>0.55</td>
<td>0.42, 0.67</td>
<td>0.59</td>
<td>0.40, 0.71</td>
</tr>
<tr>
<td>HyPer dysphonia</td>
<td>0.52</td>
<td>0.33, 0.72</td>
<td>0.57</td>
<td>0.45, 0.75</td>
<td>0.64</td>
<td>0.44, 0.80</td>
</tr>
<tr>
<td>HyPo dysphonia</td>
<td>0.64</td>
<td>0.59, 0.68</td>
<td>0.64</td>
<td>0.61, 0.67</td>
<td>0.65</td>
<td>0.58, 0.69</td>
</tr>
</tbody>
</table>

Figure 1-1. HyPo dysphonia VF in abduction.

Figure 1-2. HyPo dysphonia VF in adduction.
Figure 1-3. VSK in a patient with HyPo dysphonia, anterior segment of VF (OQ = 0.66).

Figure 1-4. VSK in a patient with HyPo dysphonia, middle segment of VF (OQ = 0.67).

Figure 1-5. VSK in a patient with HyPo dysphonia, posterior segment of VF (OQ = 0.68).

Hyperfunctional dysphonia

LVS images for HyPer dysphonia are shown in Figures 2-1 and 2-2. In the case of hyperfunctional dysphonia, the OQ values were lower in the anterior and middle segments of the VF than in the posterior third (Figures 2-3, 2-4, and 2-5). Mean values of OQ in our study of patients with hyperfunction were slightly lower compared to the control group and significantly lower compared to hypofunctional dysphonia.

VSK for the anterior segment in the case of hyperfunctional dysphonia showed left-right asymmetry and phase shift, smaller amplitude, and shortened open phase.

At the middle segment left-right asymmetry, diminished amplitude on the right, and phase shift were observed.

The posterior showed smaller amplitude, phase shift, and shortened open phase.
Figure 2-1. HyPer dysphonia VF in abduction.

Figure 2-2. HyPer dysphonia VF in adduction.

Figure 2-3. VSK in a patient with HyPer dysphonia, anterior segment of VF (OQ = 0.49).
Conclusions

VSK is an additional method of voice diagnostics with a wide range of possible applications. It is an effective tool for analyzing and monitoring the pathological changes in the VF vibrations, providing quantitative parameters for objective evaluation of the VF motion [1-4]. However, the greatest value and significance of VSK lies in the possibility to monitor progress of treatment and/or voice rehabilitation. VSK is simple, less time-consuming, cost-effective, and accessible in comparison to the other procedures. Thus, it may be an excellent complement to the stroboscopic examination in everyday clinical practice.

References
