

Potential Causative Factors for Saccular Disorders: Association with Smoking and Other Laryngeal Pathologies

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Summary: Objective. To describe risk factors, clinical presentation, and outcome of patients with saccular disorders.

Study Design. Case control with chart review

Methods. A single center retrospective study. Case group included all adult patients, presenting with saccular disorders (saccular cyst or laryngocele), between the years 2010 and 2015. A matched group of patients with vocal fold cyst served as the control.

Results. Twenty-nine patients met the inclusion criteria: 15 males and 14 females; the mean age was 60.5(±11.2). The median follow-up period was 10 months (range 2–48). Overall, 75.9% (22) had a positive smoking history; 55.2% (16) were active and 20.7% (6) were past smokers. The median pack-years of all smokers in the saccular disorder group was 40 (range 1–67). Saccular disorder patients demonstrated significantly higher prevalence of active smoking when compared to control patients (55.2% versus 17.9%, $P = 0.014$).

Sixty-nine percent of the patients had some synchronous vocal fold comorbidity. The leading vocal fold comorbidity was Reinke's edema in 41% (12). Synchronous vocal fold comorbidities were significantly more prevalent in smokers compared with nonsmokers—82% (18 of 22) and 29% (2 of 7), respectively ($P = 0.008$).

Surgical treatment was performed on 26 patients; all of whom underwent complete resection, either by endoscopic (92%), external (4%), or combined external and endoscopic (4%) approaches. There was a single case of recurrence (4%), 10 months following initial resection.

Conclusion. Saccular disorders are associated with smoking and synchronous vocal fold comorbidity. Complete resection is recommended as surgical outcome is excellent.

Key Words: Saccular–Laryngocele–Smoking–Vocal folds–Endoscopic.

INTRODUCTION

Saccular cyst and laryngocele are uncommon pathologies of the laryngeal saccule and ventricle, known as “saccular disorders”.^{1,2} Historical case series^{1–5} have classified and delineated management principles, which have changed greatly in recent years.^{6–8}

The laryngeal saccule is located between the vestibular and vocal folds (VeF and VoF, respectively), exvaginating to form a blind sac adjacent to the paraglottic space. Its physiologic function is unclear. Lubrication of the VoF has been hypothesized, although this function seems to have greater physiologic importance in apes.⁹

Saccular cyst is a dilation of the anatomical laryngeal saccule, filled with mucus, as a result of its orifice obstruction. Hence, it does not communicate with the laryngeal lumen.^{1,2} Saccular cysts are classified based on their relation to the VeF and VoF^{1,2}: (1) *anterior cysts* lie between the VeF and VoF; and (2) *lateral saccular cysts* extend posterosuperiorly into the VeF and aryepiglottic folds. Clinical presentation may include various vocal

complaints, cough and globus,^{1–8} and rarely, airway obstruction.² The management of saccular cysts has shifted in recent years as complete endoscopic resection using CO₂ laser⁶ has replaced previous methods that included endoscopic excisional biopsy, endoscopic unroofing, and external approach.^{1,2}

Laryngocele is an abnormal dilation of the saccule and the ventricle above the level of the thyroid cartilage, which communicates with the laryngeal lumen.^{1,2} It is classified by both its anatomic relation to the thyrohyoid membrane and by its content. An internal laryngocele lies medial to the thyrohyoid membrane whereas an external one lies lateral to it. A combined laryngocele is situated on both sides of the thyrohyoid membrane. Unlike saccular cyst, laryngocele is filled with air.^{1,2} If the orifice is obstructed and filled with pus, it is termed laryngopyocele. Hence, internal laryngopyoceles are indistinguishable from infected saccular cysts.^{2,3} The etiology of laryngocele remains unclear up to date, yet three theories have been promoted: (1) atavistic remnants of lateral air sacs, (2) congenital anomaly, and (3) chronic exposure to increased translaryngeal pressure.⁵

The presentation of an internal laryngocele is similar to that of a saccular cyst, whereas an external laryngocele presents as a cervical mass. Initially, an open surgical approach was recommended.^{1,2} However, recent publications advocate endoscopic approach alone or combined with an open approach as indicated.^{7,8}

In this study, we review adult patients presenting with saccular disorders, examine possible new risk factors that may

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contribute to the development of these disorders, and discuss the surgical outcome and benefits of its excision.

MATERIALS AND METHODS

After obtaining Institutional Review Board approval, we performed a single-institute, retrospective, matched case-control study. Patients who appeared with a mass suspected for a saccular disorder at our laryngology service between the years 2010 and 2015 were enrolled to the case group. The control group comprised of twenty nine matched patients who have undergone direct laryngoscopy (DL) and had a histological diagnosis of vocal fold cyst following excision. Matching was based on gender, age, and comorbidities. Saccular disorders were diagnosed and classified according to De Santo et al and Holinger et al.^{1,2} Exclusion criteria included all patients whose final pathology was not compatible with a saccular disorder.

Recorded data included gender, age, comorbidities, and smoking history. For the case group, we also recorded nonmalignant laryngeal copathologies, previous radiation, neck surgery or direct laryngoscopy, history of laryngeal carcinoma, presenting symptoms, operative approach, macroscopic findings, side and classification, final pathology report, recurrence, complications, and length of follow-up. Socioeconomic status was categorized according to residential address as documented, following the Israeli Central Bureau of Statistics' 2004 Peripherality Index of Local Authorities.¹⁰ Laryngeal comorbidities were defined as ipsi- or contralateral according to their relation to the saccular

disorder. This was also defined if a side was stated as dominant in a bilateral comorbidity (eg, Reinke's edema). Relative size was measured and divided according to the degree of concealment by the saccular disorder: (1) up to 25%; (2) 25%–50%; (3) 50%–75%; and (4) more than 75% of the ipsilateral VeF and Vof were affected by the disorder (either the VeF was distended or the VoF was obscured by the lesion) (Figure 1; A1; B1).

Smoking status was defined as follows: ex-smokers were subjects who had smoked daily and ceased smoking over 1 month before initial clinic meeting. Nonsmokers were those who had never smoked.¹¹ Smokers were subdivided into light, moderate, and heavy smokers (<10, 10–20, and > 20 cigarettes per day, respectively).^{11,12}

Prior to surgery, all patients underwent evaluation by an expert laryngologist (Y.L.), including videostroboscopic examination either by flexible video rhinolaryngoscope ENF-VQ (Olympus, Center Valley, PA, USA) or Karl Storz 10 mm, 70° rigid endoscope (Karl Storz GmbH & Co. Tuttlingen, Germany).

Surgical Procedures

All surgical excisions were performed under general anesthesia, using a 5 mm laser endotracheal tube (Mallinckrodt, Covidien, Mansfield, MA, USA) and Wolf laryngoscope and suspension system (Richard Wolf Medical Instruments Corporation, Vernon Hills, IL, USA). Except for a single case of external approach, in all other cases, CO₂ laser (Lumenis, Yokneam Industrial Park, Israel) was used in a super-pulse mode, 3–6 W. All saccular

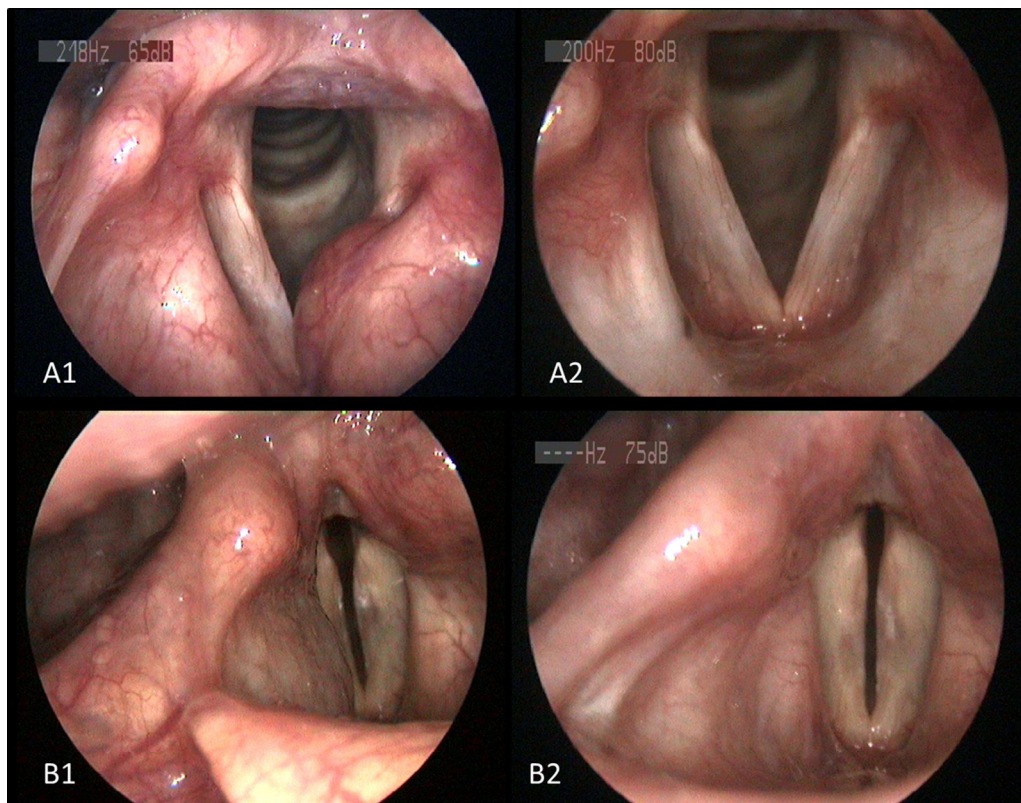


FIGURE 1. Pre- and postoperative evaluation of saccular disorders. **A1.** anterior saccular cyst concealing 100% of vocal folds and 75% of vestibular fold. **A2.** After endoscopic translaryngeal resection (see Materials and Methods). **B1.** Combined laryngocele. **B2.** After endoscopic transhypharyngeal resection (see Materials and Methods).

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