

## Sulcus Vocalis: A Rare Cause of Vocal Hoarseness. Where are We in Its Treatment?

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**Abstract:** Sulcus Vocalis is a rare genetic/ acquired cause of hoarseness of voice. Very less is mentioned in literature about its possible causes, differentials and treatment options. Awareness of this condition will allow the physicians as well as the patients to carry out the appropriate treatment. We present a case of a 35-year-old man who presented with hoarseness of voice since 10-years.

**Keywords:** Sulcus Vocalis, Hoarseness, voice.

### INTRODUCTION

The term sulcus vocalis (SV) is a rare cause of hoarseness of voice, it consists of various anatomic indentations of the vocal cord (fold), ranging all the way from a shallow longitudinal furrow to deep focal pit with bad prognosis. These anomalies can be both unilateral and bilateral and can have a widely varying effect on the vibratory function of the vocal cords. These sulci under light and electron microscopy have characteristic findings of fibrosis, vascular proliferation, dense collagen deposition, increased thickness of basement membrane, and sparse elastin deposition at the base of the sulcus [1]. The histological view is characterized by a sac-like space (Figure 1). The cause of SV is unclear; it has been attributed to both genetic and acquired origin [2]. A three-tiered classification system was made on the basis of anatomic presentation.

This classification divides into symptomatic true variant (classified as Types II and III) and typically asymptomatic subtle variant (classified as Type I) [3]. Prevalence of this condition varies greatly in the literature due to the difficulties in visualizing the defect. A study done by Morgan et al reported the prevalence of SV to be at 3.1% in a population [4]. Various treatment strategies have been attempted with some achieving a satisfactory result.

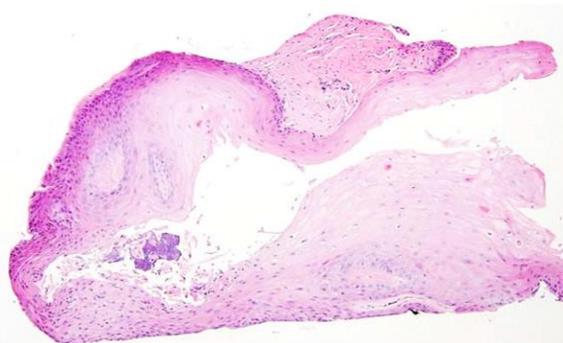
### CASEPRESENTATION

A 35-year-old male, a hospital file section manager reported with hoarseness of voice for 10 years. He had difficulty in varying the pitches while speaking. He also reported that his current job required long hours of voice usage. His colleagues described his voice as like. No other associated problems were reported. He reported of vocal tiredness after excessive use of voice. He was previously seen in another hospital in India by an otolaryngologist who told him that had nodules and should rest his voice. Later when he didn't show any

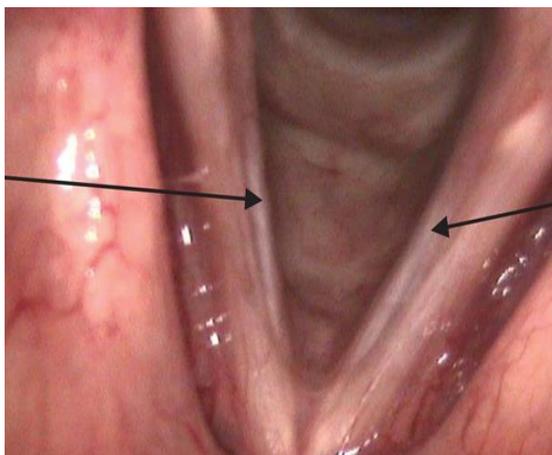
change, surgery was done for the same but there was no improvement whatsoever. He did not smoke but was an occasional alcoholic. Currently, he wasn't taking any treatment for the hoarseness.

A further detailed assessment was carried out by an otorhinolaryngology's and a pathologist. Fiberoptic flexible laryngoscopy (FFL) was used for viewing the glottis and vocal tract. He was first diagnosed to have a scar of unknown etiology on the vocal cords but on observing further it was confirmed as bilateral sulcus vocalism.

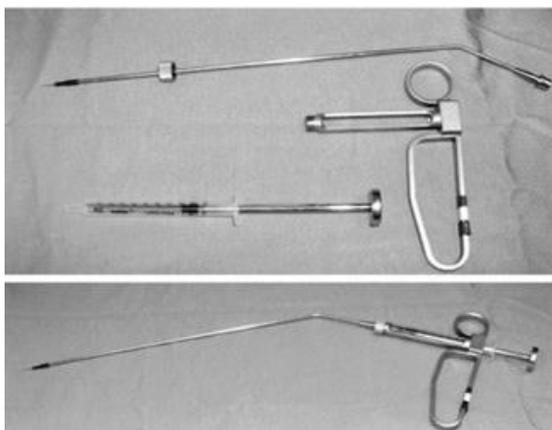
Due to this dysphonia voice handicap index (VHI) was used to assess the psychological impact of his condition. Voice Evaluation was carried out for three consecutive days before a decision was made to carry out medical management and later he was discharged. He came back a month later with no significant change in voice.



**Fig-1: Sulcus anatomy and histologic changes. A sac-like space is seen lined by hyperplastic squamous epithelium. (Lee A, Sulica L, Aylward A, Scognamiglio T. Sulcus vocalis: A new clinical paradigm based on a re-evaluation of histology. The Laryngoscope. 2015;126(6):1397-1403)**



**Fig-2: Bilateral Sulcus Vocalis (Rajasudhakar R. Effect of voice therapy in sulcus vocalis: A single case study. South African Journal of Communication Disorders 2016;63(1))**



**Fig-3: Xomed-Treace oro-tracheal injector (Kwon S, Kim H, Song J, Cho C, Park S, Choi J et al. Vocal Fold Augmentation with Injectable Polycaprolactone Microspheres/Pluronic F127 Hydrogel: Long-Term In Vivo Study for the Treatment of Glottal Insufficiency. PLoS ONE. 2014;9(1):e85512)**

**Table-1: Types of Sulcus Vocalis**

TYPE	Epithelium invagination	Dysphonia	
Type 1	Limited to Lamina propria.	Normal voice	
Type 2 (sulcus vergeture)	Along the vocal fold.	Mild	
Type 3 (sulcus vocalis)	Into the Vocalis muscle.	Severe	

## INVESTIGATIONS

Fiber-optic flexible laryngoscopy (FFL) was done to view the vocal tract and glottis, bilateral scars were seen on the vocal cord (Figure 2). Stroboscopy was done which demonstrates a moderate- severe degree of vocal fold scarring bilaterally with incomplete closure.

## DIFFERENTIAL

### Differentials to this condition can be

Physiological- superficial scarring of epithelium e.g; presbylarynx or senile larynx which refers to the age-related alterations in the upper aerodigestive tract that can result in changes to a person's voice.

Pathological- vocal fold lesions that have grown into the deeper tissue creating a scare such as seen in repeated hemorrhaging, radiation therapy and laser surgery. While inflammatory causes like Myositis of the vocal muscle following laryngitis or upper airways infection can cause swelling of the vocal folds or development of vocal fold nodules, polyps or cysts. Prolonged voice misuse can also cause swelling of the vocal folds or development of vocal fold nodules (benign laryngeal masses )

Diagnosis may be difficult even by stroboscope which is considered the “golden diagnostic tool” for vocal fold diseases. However, the detailed history of the patient condition and exposing factors remains the cornerstone of diagnosis.

## TREATMENT

The treatment of sulcus vocalis should be aimed at improving the anatomical and functional features of the vocal cords and enhance vocal quality. In our case, he was given BETADINE gargle and mouthwash, pantoprazole, and anti-inflammatory drugs also booked for voice therapy. The patient showed no improvement after a month. In literature, medical treatment of this condition is difficult but it could be achieved by several approaches such as:

### Combined therapy

This consists of intensive vocal rehabilitation following the vocal fold mucosal surgery via slicing mucosa technique. This therapy aims to interrupt the tension of the longitudinal fibrotic lines and to detach

the mucosa of the sulcus. An analysis of its results in 10 patients with SV showed a good result in anatomical position, vibratory pattern, and a better overall vocal quality [5].

### RADIESSE™ Voice Gel Injection (synthetic calcium hydroxylapatite)

This is injected to the Reinke's space with Xomed-Treace oro-tracheal injector (Figure 3) leading to an expansion of the outermost layer of the lamina propria (Reinke's space) which may be helpful in improving voice quality in some cases of SV.[6] An evaluation should be performed after 6 weeks of the injection and should show a relief in the intensity of dysphonia which can last upto two months.

### Microsurgery with Carbon Dioxide Laser and Injectable Collagen (for Sulcus Vergeture):

A dissection surgery in the deep subepithelial plane using a single-pulsed carbon dioxide laser at 2 to 3 W with a pulse duration of 0.1 second. When the vocal fold presents with atrophy, a bovine or autologous collagen injection is used to complete the surgery, with an injected quantity that ranges from 0.1 to 0.4 mL (the median injected quantity is 0.3 mL). A regular postoperative follow up is required after a range of 1 to 18 months and a vocal effort improvement should be achieved in the absence of vocal fatigue. [7]. In some cases temporalis fascia has been used in repairing of sulcus vocalis[8].

## DISCUSSION

Larynx contains two important soft tissue folds which are the vestibular folds (false vocal cords) and the vocal folds (true vocal cords). They play an important role in breathing, protection of the airway, and phonation. The true vocal cords are the more important of the two sets, it controls phonation, such as the pitch of the sound created, by abducting, adducting, relaxing and tensing the muscles responsible for that[9].

### Histologically, it has 4 layers (superficial to deep):

- 1- Non-keratinized stratified squamous epithelium – provides extensive protection against foreign bodies which can enter the larynx
- 2- Reinke's space – watery, amorphous layer rich in glycosaminoglycans. Due to its fluidity, it helps the epithelium situated above it to vibrate freely.

- 3- Vocal ligament
- 4- Vocalis muscle

The term sulcus vocalis has been applied to a spectrum of disorders ranging from minor vocal fold indentations to destructive lesions which can cause dysphonia, accordingly SV can be classified to 3 types (Table 1)

The cause of sulcus vocalis has long been considered to be unknown. Various literatures have mentioned some of the causes to be: genetical [10], repeated irritation / inflammation / trauma to the vocal folds, infection, degeneration of benign lesions, surgical complications, aging, repeated hemorrhaging of the vocal folds, radiotherapy and some lesser known causes like a rupture of the congenital epidermoid cysts [11].

#### **FOLLOW UP**

The patient was given BETADINE gargle and mouthwash, pantoprazole and anti-inflammatory drugs, also booked for voice therapy. The patient showed no improvement after a month. Patient decided to travel back to his home country and have another attempt at new surgical options.

#### **CONCLUSION**

Sulcus vocalis is a rare condition which is still a puzzle to solve. Only a well experienced physician can identify it during an investigation. The treatment that is usually done is symptomatic with no or little improvement. In this paper the authors conducted research of various articles that correlated with the case, and have mentioned the new treatment options which have shown to be effective.

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