

Changing trends in the nature of vocal fold motion impairment

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Abstract

Purpose: Vocal fold motion impairment (VFMI) continues to be a dominant issue in laryngology. The objective of this study is to examine a contemporary population of patients with newly diagnosed VFMI and detect changes in the nature of the cases compared with previous reports.

Materials and methods: Eighty-four patients with newly diagnosed VFMI are identified from the first author's clinic over a recent 1-year period. Patient demographics, etiology, side, and nature of the impairment are determined from retrospective chart review.

Results: Of the 84 patients, 47 (56%) are women and 37 (44%) are men. The average age of all patients is 53.4 years. Seventy-five (89.3%) of the 84 VFMI cases were unilateral, with 11% (9/84) being bilateral. The left side was affected in 52% (39/75) of the patients; the right side was affected in 48% (36/75) of the unilateral cases. The motion impairment was complete in 61.3% (46/75) of the unilateral cases and partial in the remaining 38.7% (29/75). With regard to etiology, iatrogenic causes were the most prevalent with 47.6% (40/84) of the patients. Idiopathic cases comprised 36.9% (31/84) of the patients. Neoplasms (7.1%, 6/84) and miscellaneous causes (7.1%, 6/84) accounted for smaller portions of the remainder. Of the iatrogenic VFMI cases, 27.5% (11/40) followed cervical spine operations. Chest, intracranial, and thyroid surgery accounted for 6 (15%) patients each, as did endotracheal intubation (n = 6, 15%).

Conclusions: Compared with previous reports, the incidence of iatrogenic cases reviewed here is relatively high. Anterior cervical spine surgery surpassed thyroidectomy and all other procedures as the most common cause of iatrogenic VFMI in this contemporary study.

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1. Introduction

The diagnosis and management of vocal fold motion impairment (VFMI) has been a dominant topic in laryngology for decades. The neuroanatomy of the larynx connects the clinical issues of the laryngologist with colleagues in neurology, spine surgery, chest medicine, and various other disciplines whose territory is served by the vagus nerve. Because the ability to successfully rehabilitate the impaired larynx improves, more and more physicians are recognizing the potential for improvement in patients suffering from VFMI [1].

In the time since the most recent reviews regarding VFMI, several papers have documented the association between anterior cervical spine surgery and recurrent laryngeal nerve injury [2–4]. Before this review, it had been the clinical impression of the authors that the incidence of VFMI secondary to spine surgery was higher than widely reported. The objective of this paper is to assess our experience with newly diagnosed cases of VFMI to characterize the nature of the injury; after this, comparisons will be made to published series VFMI cases to detect changes since those prior reports.

2. Materials and methods

All patients from a recent 1 year period with the new diagnosis of VFMI are identified from the medical records of the first author. The electronic medical record and standard medical charts are reviewed for the pertinent data,

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Table 1
Demographics of patients with newly diagnosed VFMI (n = 84)

Mean age	53.4 y
Female	47 (56%)
Male	37 (44%)
Unilateral	75 (89%)
Bilateral	9 (11%)

which is then tabulated. The distinction between “new” and “old” VFMI is made as follows: any patient with a history of symptoms related to impaired vocal fold motion for greater than 2 years were excluded from this study. Patients having undergone any surgical treatment of VFMI before presentation at the Medical College of Wisconsin Laryngology Clinic, Milwaukee, Wis, are excluded. This includes either injection laryngoplasty or permanent medialization. Prior speech-language intervention did not exclude the patient from the study.

The following demographic data are obtained: age at the onset of VFMI, age at diagnosis, and the patient’s sex. For iatrogenic VFMI cases, the date of onset was the date of surgery in which laryngeal innervation was at risk. For other cases, the time of onset was determined as the date when symptoms first appeared. The time of diagnosis was determined as the time when laryngoscopy first documented impaired motion. Other data gathered included the side of impairment, right, left, or both.

Vocal fold motion impairment was determined to be complete or partial depending on the laryngoscopic findings. This is determined during flexible laryngoscopy. If a vocal fold had some volitional abduction from a resting position, or some excursion with limited lengthening or incomplete adduction to the midline, that vocal fold was felt to have partial vocal fold motion impairment. If the vocal fold had no abduction from a resting position and the vocal process had no detectable excursion on repeated volitional activity, this was determined to be a complete impairment. The data are tabulated in spreadsheet form and analyzed for this study

Our data were then compared with data sets and results from the existing literature regarding the etiology of VFMI.

3. Results

One hundred five patients with VFMI are identified over a 1-year period, 84 of which were newly diagnosed. These 84 comprised the database for this review. There was a slight female preponderance, with 47 (56%) of the 84 being women and only 37 (44%) of the 84 being men. The mean age of this group was 53.4 years (Table 1).

Table 2
Nature of VFMI in unilateral cases (n = 75)

Complete immobility	46 (61%)
Partial immobility	29 (39%)
Left VFMI	39 (52%)
Right VFMI	36 (48%)

Table 3
Etiology of VFMI (n = 84)

Iatrogenic	40 (48%)
Idiopathic	31 (37%)
Neoplasm	6 (7%)
Miscellaneous	7 (8%)

Of the cases, 75 of 84 featured unilateral motion impairment. Only 11% (9/84) patients had bilateral impairment. Within the 75 unilateral cases, 39 (52%) had left-sided impairment and 36 (48%) had right-sided motion abnormalities. The paralysis was complete in 61% (46/75) of the cases and partial in the remaining 39% (29/75) of patients (Table 2).

With regard to etiology, iatrogenic impairment cases formed the largest category, with 40 (47.6%) of the 84 cases. Idiopathic cases represented the second largest group, with 31 (37%) of the 84. Neoplasms accounted for 6 cases, as did a group of miscellaneous causes, such as primary neurological disorders (Table 3).

Of the 40 cases with iatrogenic VFMI, 11 (27.5%) followed anterior cervical spine surgery. The remainder was equally distributed chest, intracranial, and thyroid operations with 6 cases in each (15%). Endotracheal intubation accounted for 6 additional cases (Table 4).

If bilateral cases were excluded, the prevalence of unilateral VFMI due to the anterior approach to the cervical spine would increase to 32.4% (11/34), and thyroid cases would decrease to 11.8% (4/34). The prevalence of the other causes of iatrogenic VFMI would not change notably (Table 5).

4. Discussion

In this study, nearly half of the unilateral VFMI cases were on the right side (48%, 36/75). This is in contrast to the 37.5% reported by Benninger [5] and 32% by Terris [6], reflecting the historical preponderance of the left-sided VFMI due to chest malignancies, chest trauma, and surgery of the thoracic structures.

The incidence of iatrogenic injury was high in our study, comprising 48% the cases. In the Henry Ford study, combining the surgical trauma and endotracheal intubation groups results in an overall incidence of only 31.4% of the cases being iatrogenic.

Authors have previously recognized the risk to laryngeal and pharyngeal structures from anterior cervical spine [7]. For spine surgeons, the popularity of the anterior approach

Table 4
Etiology of iatrogenic VFMI (n = 40)

Anterior cervical spine surgery	11 (27.5%)
Posterior fossa surgery	6 (15%)
Thoracic surgery	6 (15%)
Thyroid surgery	6 (15%)
Endotracheal intubation	6 (15%)
Other	5 (12.5%)

Table 5

Etiology of iatrogenic VFMI, bilateral cases excluded (n = 34)

Anterior cervical spine surgery	11 (32%)
Posterior fossa surgery	6 (17%)
Thoracic surgery	6 (17%)
Endotracheal intubation	5 (15%)
Thyroid surgery	4 (12%)
Other	2 (6%)

reflects the advantages of less postoperative pain, easier exposure, and improved access to the vertebral body for grafting and placement of plates. The reasons for choosing one side over the other, when not otherwise dictated by a patient's symptoms, include surgeon preference, concern for nonrecurrent laryngeal nerves, and other anatomical factors as noted in the spine literature [2,3,8].

Anterior cervical spine surgery was the most common cause of iatrogenic VFMI noted in this review. The relative preponderance of iatrogenic cases overall (48% compared to 31% as previously mentioned) may represent an inherent referral bias here at this institution. Despite vigorous clinical programs in *Neurology* and *Neurosurgery* at the home institution, relatively few cases of VFMI secondary to neurodegenerative disorders or stroke were noted. These differences reflect the important limitations of this review, that it is limited to a single institution; beyond that, the differences also reflect the clinical material in one regional referral clinic over a relatively short period. The volume of newly diagnosed cases of VFMI, however, reflects a fair volume overall and merits consideration on this basis. It is the intention of the authors to follow-up on the current study with a 5-year overview of the clinic population.

The impact of including patients with partial VFMI is difficult to determine. This subset of patients is not specifically discussed on prior studies, though it is not clear whether or not they are included on the population of patients as a whole. Because the signs, symptoms, and management of these cases parallel those of complete VFMI, they are considered together in this paper regarding the etiologies of impairment. The determination of a "partial" immobility is a clinical one. In an unpublished pilot study, we endeavored to assess our clinical accuracy in detecting partial VFMI. When reexamined as a group, 13 of the 29 partial VFMI patients had undergone laryngeal electromyography. Of these, 12 of the 13 revealed laryngeal neuropathy, including superior and/or recurrent laryngeal

nerve injuries in some combination. The remaining patient with a normal laryngeal electromyography and partial VFMI was 20 years old who had been endotracheally intubated for several days after a closed head injury. The patient's cricoarytenoid joint was found to be stiff at direct laryngoscopy. Our experience with this subset of patients strengthened our impression that the clinical detection of partial VFMI reflects real pathology and that it represents laryngeal neuropathy in most of the cases.

5. Conclusions

Although the anterior approach to the cervical spine has previously been recognized as a cause of iatrogenic VFMI, this is the first reported series in which it is the leading cause of VFMI. A difference is also noted in the relative distribution of right- and left-sided VFMI cases, with a higher than expected number of right-sided motion abnormalities. Future studies will investigate the incidence for each of the major etiologies collected over a 5-year period; relative outcomes between the different causes and degree of injury will be studied as well.

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