

# Voice Changes in the Elderly

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## KEYWORDS

• Voice • Elderly • Impaired vocal function • Presbyphonia

## KEY POINTS

- In the elderly, a decline of the voice can lead to introversion and social withdrawal. To compound communication difficulties, many peers of the elderly suffer from age-related sensorineural hearing loss.
- Numerous quality-of-life studies have demonstrated and confirmed how diminished and impaired vocal function causes a rapid deterioration of quality of life in the elderly.
- Stroboscopy is an ideal diagnostic tool for evaluating the dysphonic elderly patient and visualize subtleties in glottic insufficiency and decreased mucosal wave, which hallmark findings in presbyphonia.
- Voice therapy, as well as surgical interventions centered on improving glottic insufficiency, can help to improve voice quality in patients with presbyphonia.

## INTRODUCTION

A cry announces our entry to the world on the day we are born. The voice, a sophisticated synchronization between our respiratory, neurologic, and phonatory organs, goes on to serve as our main expression and serves as an indicator of our physical and emotional health throughout the life span. A decline in the voice in the elderly can lead to introversion and social withdrawal. To compound communication difficulties, many peers of the elderly suffer from age-related sensorineural hearing loss.<sup>1</sup> Numerous quality-of-life studies have demonstrated and confirmed how diminished and impaired vocal function causes a rapid deterioration of quality of life in the elderly. Although few longitudinal studies on vocal aging have been published, researchers are driven to quantify the impact of age-related changes on daily life.<sup>2</sup>

The prevalence of dysphonia in the elderly is reported to range from 12% to 47%.<sup>3</sup> In 1 cross-sectional study using the 2012 United States National Health Interview Survey, about 10% of respondents over the age of 65 reported having a problem with their

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Disclosure: The authors have nothing to disclose.

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Otolaryngol Clin N Am ■ (2018) ■–■  
<https://doi.org/10.1016/j.otc.2018.03.012>

0030-6665/18/© 2018 Published by Elsevier Inc.

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voice. Of these, 1 in 10 sought medical treatment, and of those, only 22% saw an otolaryngologist.<sup>4</sup> Presenting complaints for age-related voice changes can vary greatly, and can include decreased loudness or projection, vocal fatigue, changes in pitch, altered pitch range, and a rough or breathy voice.<sup>5,6</sup> These traits have inevitable overlap with the presentation of many vocal pathologies, so symptoms of aging versus pathologic changes must be distinguished. Various systemic conditions that increase with age may impact the various phonatory organs, including the respiratory system, neurologic control of speech and laryngeal movement, and, of course, the larynx. In this article, we focus on the larynx itself, and explore the normal and gradual impact of organic aging on the voice as well as the pathophysiology of common pathologies that impact voice quality in the elderly.

### **PATHOPHYSIOLOGIC CHANGES OF AGING VOCAL FOLDS**

Clinical studies analyzing the composition of vocal folds were inspired by consistent laryngeal physical examination findings that were described in elderly patients complaining of diminishing vocal performance. In addition to vocal fold bowing and glottic insufficiency, the vocal folds themselves seem to become thin, as though they were deteriorating. As they aged, the vocal folds were losing their elastic and collagenous properties, a process that seemed akin to the changes observed in aging skin. Such alterations in the makeup of the vocal folds contributed to a progressive stiffening and thinning of the vocal folds over time, which was then clinically correlated with loss of vocal efficiency in the aging voice.<sup>7</sup>

The most important part of the vibrating vocal fold is its cover, which consists of a stratified epithelial layer with a superficial lamina propria directly beneath it. The lamina propria is composed of 3 layers, each defined by its histologic makeup. The superficial layer is characterized by a generalized absence of collagen and elastin, the intermediate layer has high levels of elastin with some collagen, and the deep layer is defined by an abundance of threadlike collagen and fiber with low levels of elastin. Together with the extracellular matrix found within the lamina propria, the elastin and collagen within the lamina propria contribute to the viscoelasticity of the vocal folds.<sup>8</sup> Given the robust demand of repetitive, high-frequency impact that the vocal folds incur from phonation, one can imagine how critical collagen's role is to preserve the integrity of the vocal folds through recoil and stretch.<sup>9</sup> The ability of the vocal folds to withstand such repetitive use is critical to their ability to function over the course of years and even decades. To that end, any variation in the amount of elastin and collagen in the lamina propria changes the histology of the vocal fold, which manifests as dysphonia and underscores the pathophysiological changes of an aging voice.

In 1997, Kiminori Sato and Minoru Hirano pioneered clinical investigations to determine whether changes in the lamina propria of vocal folds could explain physicians' clinical findings of dysphonia. Using light microscopy to examine the elastin fibers in the vocal folds of aging men they observed that the elastin fibers in male vocal folds had degenerated, and as a result the vocal folds seemed to be irregularly fragmented and atrophic. When Sato and Hirano compared these findings to age-matched female vocal folds examined by light microscopy, they found the elastin fibers did not decrease in density. The degeneration of elastin fibers they had observed in the intermediate layer of the lamina propria was specific to male vocal folds.<sup>10</sup> After this discovery of gender-specific changes in vocal fold histology, clinicians began to distinguish between the dysphonia presenting in elderly men from the vocal changes presenting in elderly female patients. As a result, the decrease in elastin in the lamina

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