Chapter 46
Bamboo vocal folds (B-Nodes) examination with white light and with NBI® illumination. A case for a non-traumatic etiology

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Abstract

We report here on vocal fold (VF) appearance in five cases of bilateral mucosal lesions referred to in the literature as “bamboo vocal folds” or as B-nodes. Our study contrasted the WL and the NBI® avascular appearance of these lesions in the VF mucosa. Among other factors, we concluded that B-nodes are unlikely to be caused by VF trauma. Treatment implications are mentioned.

Keywords: B-nodes, bamboo VF, hoarseness, VF deposits, autoimmune diseases, NBI®

Introduction

Bamboo VF (B-nodes) have been given this name as reminiscent of the banding on a bamboo stalk [1-9]. Examinations reveal transverse band-like oriented lesions in various mid-membranous portions of the VF. These creamy white or yellow lesions are submucosal with a somewhat elongated cystic or globular appearance. These lesions are bilateral, but not opposing each other as in the case of VF nodes (“kissing singer’s” nodes). Also in contrast to traditional nodes, B-nodes are oblong and transverse the entire dorsal (superior) surface of the VF on each side. Their location displaces the VF mucosa upwards. This arrangement segments the mucosal wave, causing significant voice change. The most common voice characteristics in these rare cases are: instability of pitch and intermittent (aperiodic) dysphonia, diplophonia [1-9], and at times even momentary aphasis [10].

Several etiologies have been postulated in sparse world literature [1-18]. In 1993, a report of this finding attributed an association of these lesions to systemic lupus erythematosus [11]. Subsequent publications associated these lesions with a variety of autoimmune disease processes including mixed connective tissue disorders, rheumatoid arthritis, relapsing polychondritis, and Hashimoto’s and Sjögren’s syndrome [1-10, 13-18], although a traumatic etiology was also advanced [12]. This publication described a patient with no clinical autoimmune disease but high vocal demands, and suggested that histopathological analysis of her lesions revealed microscopic findings supportive of a traumatic etiology. In a review of the current literature, where vocational information regarding potential demand is noted, it appears that about 80% of patients report demanding vocal usage, however demanding vocal usage need not be considered traumatic voice use.
It is known that B-nodes occur exclusively in females. In fact, a case of B-nodes in a male has yet to be reported. As the incidence of autoimmune diseases in women is much higher than in men, it is understandable that B-nodes are observed in women. However, as much as half the time, these lesions can occur in the absence of clinical findings or serology consistent with an autoimmune process. This may represent this pathology occurring as an initial harbinger of a yet unrevealed autoimmune disease. In fact, one study stated “no immunological signs common for all patients could be found” [10].

Challenge

Our own observations of B-nodes are based on five cases, of which, four cases were examined visually with white light (WL) and NBI® illumination. Reading these recordings prompted us to support the non-mechanical etiology. This opinion was based partially on the asymmetrical location noted in B-nodes. Since these lesions are unopposed and occur in slightly different locations than typical VF nodules, we think trauma is less likely a cause. This hypothesis was also strengthened by our histological findings of the B-node tissue obtained from one female case (CA, USA) that underwent MDL surgery showing that B-nodes were composed essentially of fibrinoid necrosis, fibrous tissue, and limited inflammatory response.

We hypothesized further that if trauma were causative, disturbances in the vascular patterns associated with these lesions would likely be present, and hence clearly noted on NBI® exam. It is documented that NBI® is an excellent tool for detecting subtle vascular changes in the mucosa and submucosa of the larynx [19-20]. Other benign laryngeal lesions associated with trauma, vocal hemorrhages, chronic laryngitis, granulomas, and polyps often demonstrate notable vascular alterations [21]. If vascular disturbances are not found in our four cases, and since most of our cases were diagnosed with immune system problems, an autoimmune etiology would be further supported. Etiologic theories have clinical impact, influencing the course of management, with everything from logopedic therapy to autoimmune systemic medications to local steroid injections to surgical excision having been suggested as possible treatment methods [1, 3, 6].

Cases

The five cases discussed here come from two clinical locations. Two were examined in Moscow, Russian and three in Oakland, CA, USA.

Russian: Case 1

On December 17, 2014, a 29 year-old female was examined at the Federal Research Clinical Centre of ENT, Russian Federation Ministry of Public Health in Moscow. She presented with a 6-month history of hoarseness, phonasthenia, discomfort in the larynx, and a feeling of debris in the throat. She was employed in a call center and complained of an abnormal voice. She was also managed by the V. Nasonova Institute of Scientific Research of Rheumatology in Moscow, where she was treated with rituximab therapy for Sjögren’s syndrome with improvement.

Her symptoms also included moderate afternoon weakness and muscle pain. Changes in her blood samples included: moderate anemia, increasing blood sedimentation rate, leukopenia, increased albumin, gamma globulin and fibrinogen levels. Prior to her December 17, 2015 exam, she was also treated with voice therapy using logo-phonopedic correction based on a “BOSLAB LOGO” program-apparatus system. Gains were non-curative.
On December 17, 2015, she underwent a full battery of phonatory function studies (PhFS) [21]. The studies included visualization of the larynx using both WL and NBI® illumination. The NBI® equipment used was Olympus tower Model OEV261H to which Olympus distal chip camera model CV-170 was connected [22]. In addition, laryngovideoendoscopy (LVS) and high speed digital phonoscopy (HSDP) were conducted. Results of these kinematic exams are discussed elsewhere in Chapter 29 of this volume. Figure 1 shows the appearance of the VF in this case using a WL illumination and Figure 2 shows B-nodes under NBI® illumination.

**Figure 1.** Note the transverse location of the B-nodes on the right and the left VF. Note the asymmetrical location.

**Figure 2.** Magnification of the B-nodes location seen in NBI® illumination. Note absence of vascular capillary disorganization at the location of the B-nodes.

**Russian: Case 2**

On March 24, 2015, a 29 year-old female, presented with 8-9 months history of hoarseness, moderate dryness of the nose and throat, and dryness and heat in the genital area. She was employed as an office worker. Her medical history included four years of bilateral parotitis with frequent recrudescence and frequent bronchitis and sinusitis. Signs of xerostomia, xeromycteria, and xerophthalmia were evident on examination.
Consequently, she underwent a full battery of PhFS, including visualization of the larynx using both WL and NBI® illumination. The same equipment was used as in Case 1. In addition, LVS was performed. On examination B-nodes were identified as documented in Figure 3. Her blood analyses showed a +ANA of 1:10240. Based on these results a tentative diagnosis of Sjögren’s syndrome was suggested and a referral to the V. Nasonova Institute of Scientific Research of Rheumatology in Moscow confirmed her Sjögren’s syndrome.

**Figure 3.** Again, vascular disruptions are minimal and do not display hemorrhagic events that we feel could be indicative of phonotrauma.

**American: Case 3**

On August 20, 2015, a 68 year-old female presented with a 2-year history of hoarseness for evaluation in our Voice Disorder Clinic. She had also been diagnosed with rheumatoid arthritis two years previously after presenting with polyarthritis. Her diagnostic serology included +ESR at 43 mm/hr and a +Rheumatoid factor at 241 IU/ml. She was treated with methotrexate and entercept. Her past medical history included a MDL with removal of a VF cyst 10 years previously. Also noted were recurrent bronchitis, pulmonary fibrosis, hyperlipidemia, GERD, and depression.

Video recordings were made with an Olympus NBI® system (Center Valley, PA, USA): Model OTV-S190 processor and CLV-S190ENT light source. Visualizations were performed with a distal chip flexible endoscope. The flexible scopes used were an ENF-VH scope, a 3.9mm OD 1080HD distal chip scope, or an ENF-V3 2.6mm OD high resolution distal chip scope.

On examination B-nodes were identified as noted in Figure 4. She was initially treated with clotrimazole troughs for possible laryngeal thrush, related to long-term steroid inhaler usage for her pulmonary disease. This was followed by oral prednisone for the B-nodes. This medical therapy resulted in no improvement in her voice. Presently, she continues to live with her persistent dysphonia and is weighing surgical excision.
**American: Case 4**

On March 3, 2015, a 56 year-old female presented with a 1-year history of hoarseness and mild arthritis. She is self-employed as an artistic painter and has no extraordinary vocal demands. Her past medical history was pertinent only for hypothyroidism and a persistent microscopic hematuria.

On examination B-nodes were identified as documented in Figure 5. Her subsequent blood analyses revealed a normal ESR of 21 mm/hr, normal ANA for 11 sero-subtypes, normal Rheumatoid factor, and a normal TSH of 1.65 U/ml. One year later, she has failed to demonstrate clinical evidence of an autoimmune disease process. She has declined any specific treatment for her vocal condition to date.

**Figure 4.** WL and NBI® images of B-nodes in Rheumatoid arthritis.

**Figure 5.** WL and NBI® images documenting a lack of neovascularization and asymmetry of B-nodes between sides.
American: Case 5

On December 10, 2013, a 31 year-old female presented with a 1-year history of hoarseness and voice breaks. She was a homemaker with no unusual vocal demands. At presentation to our Voice Disorder Clinic, she had been previously diagnosed with Mixed Connective Tissue Disease for 10 months. Her presentation at that time included polyarthritis and Raynaud’s phenomenon. Serology results included +ANA for 4 subtypes, an elevated CRP of 1.3 mg/L, and elevated ESR of 26 mm/hr. She has been treated with various anti-inflammatory medications including prednisone, methotrexate, hydroxychloroquine, meloxicam, and abatacept. Her initial WL exam documented B-nodes (Figure 6). Due to the duration of her symptoms and lack of response to voice therapy and a variety of anti-inflammatories, a MDL procedure was performed with excision of the lesions.

The histopathologic examination of the VF biopsies with hematoxylin-eosin staining at 10x and 40x magnification are shown below (Figure 7). The more intensely staining area is characteristic of these lesions. There are dense linear fibrinoid necrotic deposits. These appear as eosinophilic “rods” surrounded by fibroblasts, histiocytes, and occasional multinucleated giant cells. This represents a granulomatous reaction, often seen in autoimmune disorders. She had a dramatic improvement in voice quality and remains stable by examine and voice quality 12 months postoperatively (Figure 8).
Discussion and conclusions

B-nodes are rarely seen in clinical settings and since our initial encounter with this condition in the mid 1980’s, we have seen only six such cases in our combined practices. Unfortunately, we have archived the visual data on only five of these cases (two from Russia and three from USA). Also, only four cases are documented with both WL and NBI® exams. These are the only cases ever reported (as far as we are aware, per PUBMED search of November 2, 2015) that captured B-nodes with NBI®.

Results from these five cases provide overall support that an autoimmune etiology rather than a traumatic one is responsible for B-nodes formation. However, as has been described in the literature and illustrated by Case 4, B-nodes may actually precede the development of systemic disease. All five of our cases involved woman, which is also supported by the literature.

It seems likely that if phonotrauma were the primary inciting event, documented cases in men would be reported. Additionally, four of five of our cases involved patients without high vocal demands. The asymmetrical location of the B-nodes in all five cases speaks against phonotrauma. Finally, NBI® visualizations that clearly document no vascular distortions, proliferations, or bleeds associated with the B-nodes support an atraumatic origin.

As previously mentioned, etiology is important as it may influence our treatment decisions. If these lesions are traumatic in nature, it seems that voice and anti-inflammatory therapy are more likely to be helpful. If they are not, more prompt surgical intervention may be warranted. Two of our five cases were offered voice therapy but did not respond to it. Four of five cases with documented autoimmune disease received medical therapy to control systemic disease but did not show a favorable voice response. The one case operated upon responded positively to surgery with a much-improved voice and no recurrence one year later.

NBI® studies of more cases are anticipated and as these become available, we believe the atraumatic nature of these lesions and appropriate management will become better defined as more cases are studied.

References


19. Chapter 23 in Volume I: Technology of this publication.

