PNMEDICAL

BREATHING, SPEECH AND SWALLOW – HOW IT ALL FITS TOGETHER

Traditionally, breathing, talking and swallowing have been considered separate entities that all just happened to take place at the same place – the mouth and throat.
More recent evidence, however, has shown that these tasks are actually intertwined, leading to new paradigms and therapeutic approaches.

PART I: BREATHING AND SWALLOWING:

The swallowing reflex is actually a multistep patterned response that is based on learning and experience. While its main function is the uptake of food and liquid, its second most important function is the protection of the airways. As breathing and swallowing occur in the same place, these two functions need to be highly coordinated in order to both maintain ventilation during uptake of food and to prevent aspiration, which can be fatal. Aspiration occurs if food or liquid is moved down the larynx below the vocal fold instead of down the pharynx to the stomach. Prevention of aspiration, as is discussed below, is highly dependent on a correct breathe-swallow pattern.

Swallowing can be divided into several phases. It starts with the anticipatory phase, during which the food or liquid is assessed visually, and a motor plan is created in the brain on how it will be taken up and swallowed with a clear expectation on consistency and taste. During the next phase, the mouth analyzes the food or liquid, confirming or updating the visual expectation, purees it and moves it to the back. During the pharyngeal phase, the food or liquid is moved past the larynx and into the esophagus.

Aspiration occurs if that process is disturbed and food or liquid gets into the larynx and enters the airways. In healthy individuals, aspiration triggers the expiration or cough reflex, and the food or liquid gets expelled again. In the case of swallow dysfunction however, aspiration occurs frequently, often in combination with impaired cough function. This inefficient airway hygiene can lead not only to the development of pneumonia but also to malnutrition, as patients learn to avoid food that leads to aspiration. Swallow dysfunction is often seen with neurological or neuromuscular disorders, such as Parkinson's and MS, and after stroke, but is also highly prevalent in otherwise healthy elderly people.

So where does breathing come in? In most people, swallowing takes place in a very specific pattern after inhalation, during early or mid exhalation. The body automatically permits the swallow at the right lung volume. In many patients with dysphagia, this pattern is disturbed, and swallowing occurs, for example, during inhalation.
Aspiration can be prevented by re-establishing the correct breathing and swallowing pattern. Patients will train to inhale, exhale a little bit, and then swallow. These retrained patterns, together with pulmonary hygiene and good cough function, can effectively reduce aspiration and pneumonia.

Strengthening the respiratory system supports swallow function by improving laryngeal function to ensure airway protection, prevent aspiration, and reduce pneumonia risk. This is done by increasing ribcage flexibility to improve lung volume and ease of inhalation before swallowing as well as by improving cough function to strengthen the cough reflex to promote good pulmonary hygiene, airway clearance and to prevent aspiration. In addition, respiratory muscle training can lay the foundation for conscious re-training of a correct breathe-swallow pattern. The following video by speech-language therapist Mary Spremulli explains the practical application of RMT for swallow dysfunction.

Respiratory muscle training using the Breather could greatly enhance recovery from swallow dysfunction as well as help to prevent aspiration, thereby reducing the risk of pneumonia and malnutrition. Continuous use of the Breather will help maintain optimal swallow function, enjoy food and stay healthy.

PART II: BREATHING AND SPEECH

The respiratory and voice producing systems are naturally closely connected, as speech requires close coordination of the larynx and the upper and lower airway systems. The chest wall, which consists of the rib cage, sternum, thoracic vertebrae, diaphragm, and the intercostal muscles, is of particular importance for both breathing and speech. During speech production, the chest wall has to maintain appropriate levels of muscular pressure, and prevent the relaxation of pressure that occurs during normal breathing to maintain subglottic pressure for phonation. The effectiveness of the chest wall during speech depends on lung volume. At high lung volume, maintaining high pressure is easier than at low lung volume, where the expiratory muscles have to work harder for the same effect. Speech initiation at high volume is perceived as normal vocal quality, while initiation at low lung volume has decreased intensity and may be a sign of dysphonia or speech disorder. Voice disorders affect between 3% and 9% of the population, and can cause distress, disability, depression, reduced social functioning and job performance.

The diaphragm also plays a crucial role, as it adjusts the pressure during changing lung volumes, and promotes rapid inspirations during connected speech. Activation of both inspiratory and expiratory muscles together provide the best control of chest wall function and optimal speech support.

Speech breathing describes the breathing pattern that best supports phonation. Speech is usually initiated at a lung volume twice that of a normal resting breath, although it can greatly vary due to intended variations in speech, e.g. for emotional intent and greater communicative intensity. It also depends on body position, age and laryngeal function. During normal communication, inspirations are usually taken at grammatically appropriate places.

Speech is produced by airway resistance in the larynx due to narrowed glottis and vocal folds, which also slows down expiration time. Discoordination between the larynx and the lower airways may cause comorbidity between dysphonia and respiratory muscle disorders or lower airway diseases. 38% of patients with muscle tension dysphonia (MTD) for example also have asthma. Cause and correlation may however not always be clear, as laryngeal breathing disorders, such as paradoxical vocal fold movement disorder (PVFMD) are often misdiagnosed as asthma or COPD due to the similarity of symptoms. However, many voice disorders are connected to abnormal respiratory functions.

Strengthening the respiratory system and its associated musculature can support speech therapy by improving the ability for correct speech breathing. Respiratory muscle training (RMT) using the Breather can help people with dysphonia improve speech capacity and quality.

References

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