Each year thousands of individuals undergo total laryngectomy (voice box removal) as a surgical treatment for trauma or advanced laryngeal cancer. Although these individuals lose their natural voice, they can typically still speak using a prosthetic voice source because their resonant vocal tract and speech articulators remain largely intact after surgery. Unfortunately, voice prostheses often sound unnatural and robotic (e.g. the electrolarynx hand-held buzzer), or involve implants that can be difficult to hygienically maintain (e.g. tracheoesophageal valve). In this presentation I will discuss two ways in which electromyography (EMG) of voice and speech-related face and neck muscle contractions has been used experimentally to enhance alaryngeal communication. Specifically, several of our studies have shown that EMG provides an intuitive (easy to utilize) control interface for dynamic pitch modulation of electrolarynx (EL) speech. Over 20 individuals with laryngectomy have been studied using the newest version of our EMG-EL voice prosthesis system compared with other ELs, and blinded listeners rate EMG-EL speech as more natural-sounding than standard monotonic EL speech or when using manual (thumb-button-pressure) EL pitch modulation. In addition, EMG signals from the face and neck surface provide enough prosodic and lexical information during speech that they can be used for automatic speech recognition. We recently studied EMG-based speech recognition of mouthed speech in eight individuals >6 months after laryngectomy. Words were recognized at the phoneme level during mouthed (silent) sentence reading, and word error rates averaged 10.3% after only a single recording session to train the recognition models, with better performance demonstrated after more system training. This provides an optimistic proof-of-concept for EMG-based speech-to-text or synthesized speech as a communication option for individuals after laryngectomy.