Some thoughts on physiology of larynx…

The larynx performs following functions:

- Protection of respiratory passages
- Taking part in respiration
- Phonation

The first semblance of a lung like structure was seen in climbing pirch fish which developed a pouch above the gills that contained air. Subsequently a muscular sphincter like structure that protected the respiratory passages from entry of water developed. This was first seen in bichir fish

As the fish started to stay out of water for limited periods there was a need to develop a mechanism to open this sphincter so that air could enter respiratory passages…thus developed the second function of participation in respiration..

In later animals structure which resemble the aryepiglottic folds developed to assist in channelizing the food to alimentary canal.

In herbivore and carnivore mammals the intranarial position of helped in protection of respiratory passages. Carnivores had long epiglottis which took part in olfaction.

The descent of larynx in higher mammals especially humans helped in phonation at the cost of protection of respiratory passages. The descent helped create a long column air which helped in production of voice.

Thus amongst three primary functions of larynx protection is the first function, then respiration and finally phonation.

The larynx in neonates is similar to lower animals. It has a higher position, which allows epiglottis to slip over soft palate, to facilitate suckle and breathe together. This ability is lost by the end of fifth month of life, when larynx descends.

The larynx has three sphincters to perform its function of protection of respiratory passages:

1. Epiglottis, arytenoids and aryepiglottic folds which collectively constitute ‘Epilarynx’ or Laryngeal Inlet. It has a function to prevent aspiration, as larynx moves up during second stage of swallowing, epiglottis turns over backwards to cover the inlet so that food slips in pyriform sinuses. The Aryepiglottic folds act like ramparts or dams which channelize the food into oesophagus.
2. The false cords act like ‘exit valves’ i.e. they prevent egress of air. The false cords are handing downwards and pushed medially due to laterally placed ventricle and saccule which push them medially. When there is a raise in intra-thoracic pressure these sphincters close passively. Thus when the false cords have an expectorative function. And this function is retained even if there is bilateral laryngeal paralysis.
3. On the contrary the true cords prevent ingress of air, whenever there is rise in supraglottic air pressure they close off. Thus true cords have a protective function.

It is important to understand that during second stage of swallowing true cords close first, followed by false cords and finally the epilarynx.

There are water chemoreceptors on epiglottis, stimulation of these chemoreceptors by steam inhalation results in slowing of respiration and increase in tidal volume. This is how steam inhalation helps in conditions like laryngotracheobronchitis.

The decrease in size of arytenoids in humans helps in increase in the size of membranous cords which helps in phonation.

The requirements of normal phonation are as follows:

- Active respiratory support
- Adequate glottic closure
- Normal mucosal covering of the vocal cord
- Adequate control of vocal fold length and tension.

Adequate glottis closure is brought about by adductors chiefly thyroarytenoid and lateral cricoarytenoids muscles, interarytenoid which is only unpaired muscle and receives bilateral nerve supply helps close the posterior part of glottis

Cricothyoid adducts the cords by moving the cricothyroid joint..the contraction of this pulls the cords downwards and anteriorly and stretches the cords. These changes reduce the cross-sectional area of the vocal fold, reducing vibratory mass and increasing fundamental frequency.

The vocal folds alternately trap and release air; each trap/release is one cycle of vibration. This cycle is often referred to as the glottic cycle, and it is divided into phases: opening phase, open phase, closing phase, and closed phase.

This less known function of the larynx is important for increasing intra-abdominal pressure. Closure of the vocal cords achieves fixation of the chest necessary to raise intra-abdominal pressure required for daily activities like lifting weights, climbing and even for passing urine and stools