

FUNCTION OF THE CARTILAGES OF SANTORINI

BY V. E. NEGUS, M.S., F.R.C.S.

THE arytenoid cartilage in man is continued backwards towards the mouth of the oesophagus in the form of a hook-like process known as the cartilage of Santorini; the only demarcation between the body of the main cartilage and its backward projection is a histological difference (fig. 1).

To discover the function of the process it is necessary to examine the larynx of various animals, in many of which it is of greater importance, both as regards function and size.

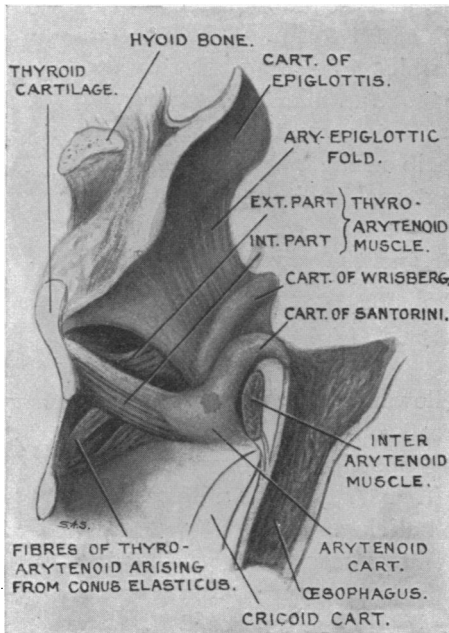


Fig. 1. Left half of larynx of a man aged 50, dissected to show the cartilages of Wrisberg and Santorini (*Homo sapiens*).

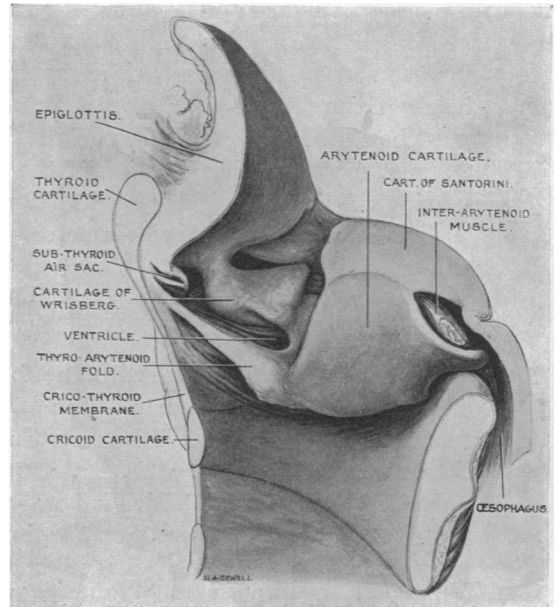


Fig. 2. Left half of dissected larynx of a horse (*Equus caballus*).

The horse (*Equus caballus*) may be taken as a good example (fig. 2). If its larynx be dissected it will be found that the ventral wall of the oesophagus has no attachment to the cricoid cartilage, but is readily lifted away from the back of the larynx. On following the wall upwards it is seen to terminate at the tip of the cartilage of Santorini, from which it is in fact suspended.

Below the curving process lies the inter-arytenoid muscle, resting partly against the process itself and partly against the body of the arytenoid cartilage.

On examining the larynx of a kangaroo (*Macropus giganteus*) the cartilages are seen to curve backwards as long hooks, but a slight modification is found, in that the part of the inter-arytenoid muscle in contact with them is replaced by a sesamoid cartilage (fig. 3). The object of this is to reduce friction when the muscle contracts in closing the larynx in conjunction with the rest of the sphincteric girdle. The arytenoid cartilage is drawn forwards towards the cushion of the epiglottis and the lateral margins of the laryngeal aperture are pressed together, preparatory to the passage of food or drink.

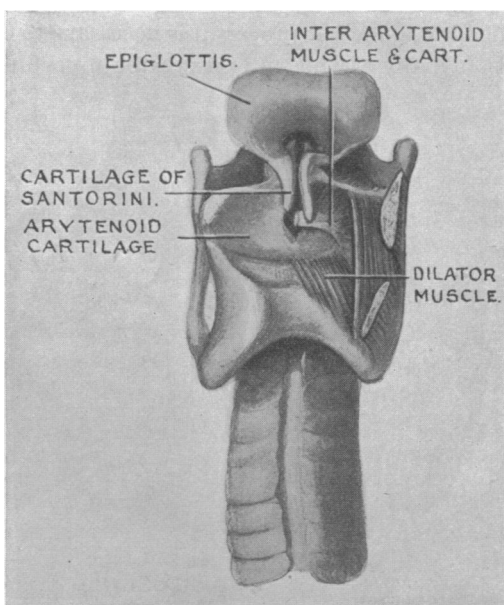


Fig. 3. Dissected larynx of a kangaroo (*Macropus giganteus*) seen from dorsal aspect. (Illustrated in *Journal of Laryngology and Otology*, Nov. 1925.)

When the inter-arytenoid muscle presses the arytenoid cartilage forwards, it causes it to tilt owing to the position of the crico-arytenoid joint; in this tilting movement the cartilage of Santorini takes part as it rotates round the arc of a circle in such a way that its tip moves upwards and forwards in a cephalic and ventral direction.

As the ventral oesophageal wall is attached to the tips of the processes, it is pulled in the same direction and the mouth of the gullet is opened in a funnel-like manner at the moment when the larynx closes.

The crico-pharyngeus muscle relaxes and the bolus of food finds a free passage from pharynx to oesophagus.

In a fox-terrier dog (*Canis familiaris*) a still further modification may be observed, namely that some fibres of the thyro-arytenoid muscle of each side are continuous with longitudinal fibres of the oesophagus (fig. 4).

In this animal the oesophagus will not only be drawn open but it will—by the contraction of these muscle fibres—help to open itself, and to draw its walls over the descending bolus of food. As the latter is prevented from re-treating and is pressed onwards by contraction of the inferior constrictor muscle there will be brought into play a creeping movement of the oesophagus over the bolus, much in the manner in which a snake engulfs its prey.

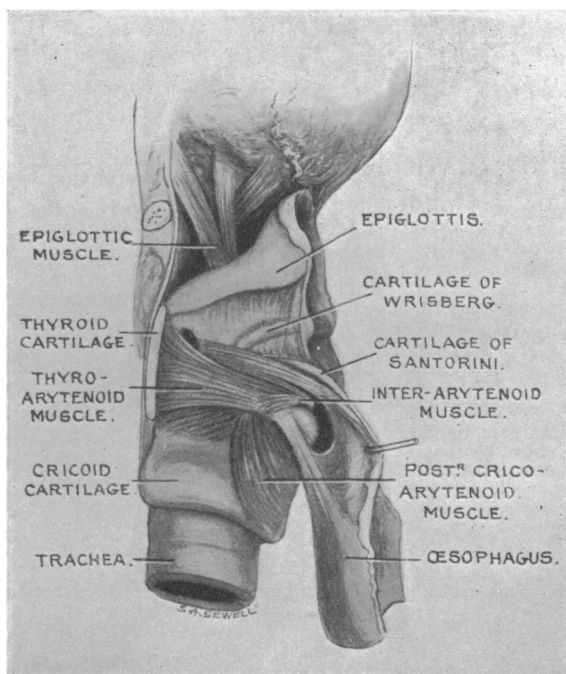


Fig. 4. Dissected larynx of a fox-terrier dog (*Canis familiaris*), showing the continuity of thyro-arytenoid muscle with longitudinal fibres of the oesophagus. (Illustrated in *Journal of Anatomy*, Oct. 1927.)

On examining the arytenoid cartilage of other animals, no process comparable to that of Santorini is found in Amphibians, Reptiles or Birds, in all of which a small larynx lies flat in a capacious pharynx. In none of these animals does the larynx offer any impediment to the onward passage of food, nor is there any sudden narrowing between pharynx and oesophagus as in Mammals. Most Cetaceans do not need to close the larynx during deglutition and in them no cartilage of Santorini is present.

Marsupials have the process well developed, but members of the cat tribe

are poorly provided for; their larynx is of a simple type and does not show the higher modification in any degree of elaboration.

Rodents have but a small cartilage but most Ungulates possess a well-marked one; the pig tribe shows a very long and slender process. The dog tribe has a very long process and there is slight attachment of the oesophagus to the back of the cricoid plate, a feature seen to a greater degree in man.

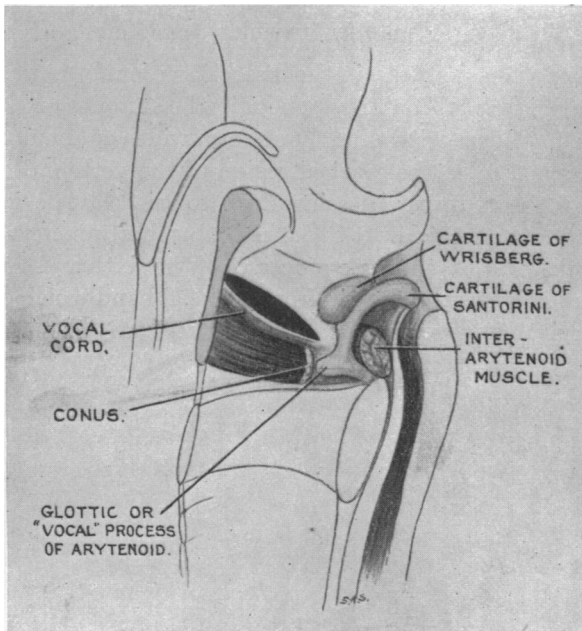


Fig. 5. High cartilages of Santorini in a sooty mangabey monkey (*Cercocebus fuliginosus*).

Most of the monkey tribe have a very long hooked cartilage with almost complete suspension of the oesophagus, as well illustrated in a sooty mangabey monkey (*Cercocebus fuliginosus*) (fig. 5); in man the suspension is less complete, but still is quite obvious if looked for.

To summarise: the cartilage of Santorini is present to give attachment to the ventral wall of the oesophagus and to assist in a mechanism by which the mouth of the oesophagus is opened during deglutition.