SOME ASPECTS OF
THE VAGAL INNERVATION OF THE CANINE ESOPHAGUS
AN ANATOMICAL STUDY

by

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ABSTRACT

The anatomical disposition of the branches from the vagus nerves to the entire canine esophagus were investigated and the effects of various nerve transections on esophageal function were observed radiographically.

Twenty one adult mongrel dogs were carefully dissected; fourteen were dissected as fresh specimens and seven were formalin embalmed and dissected later. Ten of these dogs had previously undergone various surgical nerve transections: bilateral pharyngoesophageal neurectomy, bilateral cranial thoracic vagotomy, transection of recurrent laryngeal nerves at their origins, double bilateral cranial thoracic vagotomy, and caudal thoracic vagotomies. The surgical approaches for transection of these esophageal nerves have been investigated and the various techniques are described.

Esophageal function before and after nerve transection was studied radiographically, especially by cineradiography; all radiographs were made on conscious dogs, trained to stand in a normal position freely eating barium impregnated meal from a bowl placed immediately in front of their forepaws. Radiographic observations on esophageal motility were made on fifteen additional apparently normal dogs.

Contrary to standard texts, it was found in the present study that each parent recurrent laryngeal nerve was always divided into two trunks: the recurrent laryngeal nerve proper which coursed directly to and terminated in the ipsilateral intrinsic laryngeal muscles (excluding cricothyroideus), and a more dorsally lying pararecurrent laryngeal nerve which coursed parallel to the

recurrent proper but freely supplied many branches to the esophagus and trachea. These esophageal branches were especially numerous on the left side, as the left pararecurrent nerve richly supplied the cranial thoracic esophagus as well as the cervical portion. However, the right pararecurrent nerve supplied the cervical esophagus only. Each pararecurrent nerve then terminated in the anastomotic ramus from the internal branch of the ipsilateral cranial laryngeal nerve.

From the experimental studies it was concluded that the recurrent laryngeal nerves were functionally involved with the cranial thoracic esophagus, since this region was completely paralysed following bilateral recurrent laryngeal neurectomy. Some dysfunction was also seen in the cervical esophagus after this operation.

The cervical esophagus was primarily innervated and functionally controlled by the pair of pharyngoesophageal nerves which arose solely from the pharyngeal branch of each vagus nerve.

Caudal to the origins of the recurrent nerves, the thoracic and abdominal vagi supplied and controlled the caudal thoracic and abdominal portions of the esophagus.

The vagus nerves innervate and are involved in the normal function of the gastroesophageal junction, since bilateral cranial thoracic vagotomy considerably altered the activity of this region. However, double caudal thoracic vagotomy appeared only slightly to affect the function of the gastroesophageal junction.

In addition, the course and the histological structure of the canine esophagus has been observed and described.

During this study, radiographic observations were repeatedly made, on apparently normal dogs, that put in question the validity of the currently held concepts of esophageal physiology. Propulsive esophageal contraction waves did not necessarily directly follow each oropharyngeal deglutition sequence. Swallowed boluses were frequently delayed in the cranial cervical, thoracic inlet, and cranial thoracic regions of the esophagus. Twenty two of the twenty five apparently normal dogs examined, exhibited significant reflux of material from the stomach into the caudal thoracic esophagus. More detailed radiographic studies of the normal canine esophagus under truly physiological conditions are required.

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