# Nerve Endings in the Epithelium and Submucosa of Human Epiglottis

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An electron-microscopic study of the sensory innervation of human epiglottis was undertaken. The nerve supply of this structure was abundant; numerous free unmyelinated nerve endings of 2.5–3 μm were observed in the stratified epithelium of the epiglottis associated with clear cells containing mitochondria, rough endoplasmic reticulum, microtubules and dense-cored granules. The nerve and cell complex resembled a corpuscular structure, probably of a quimiosensitive character. In the submucosa, unmyelinated nerves were observed which may come from deeper myelinated trunks, and some of them entered the epithelium. Encapsulated corpusles were also found in the submucosa. Four elements could be distinguished: nerve endings, lamellar cells, interlamellar substance, and capsule. Our observations at an ultrastructural level complete previous observations by means of light microscopy indicating that the epiglottis is a zone with an important innervation in the epithelium as well as in the submucosa. This sensory innervation probably bears a relation to reflexes, such as cough and deglution, to protect the airways. *Key words: unmyelinated nerves, intraepithelial nerves, quimiosensitive corpuscles, encapsulated corpuscles, Merkel cells, human epiglottis.*

## INTRODUCTION

The epiglottis is a zone with important reflexes that has only rarely been characterized histologically. On the other hand, physiological studies are abundant (1, 2, 3). The innervation of this structure has been principally studied by means of conventional light microscopy and immunohistochemistry in man as well as in laboratory animals (4–8). These works describe a rich sensory innervation in the epithelium and submucosa: intraepithelial free nerve endings, taste bud-like structures, corpuscle endings with glomerular patterns and myelinated and unmyelinated nerve fibres. Immunohistochemical studies have demonstrated the presence of substance P (SP) and calcitonin gene-related peptide (CGRP) in the sensory innervation of the epiglottis (6, 7, 8).

Works focusing on transmission electron microscopy of the epiglotis are scarce (6, 9) and a description of all the structures described by conventional light microscopy and immunohistochemistry has not been made.

In the present work a preliminary ultrastructural study was undertaken to complete the description of the nerve structures in the epithelium and submucosa of human epiglottis.

## MATERIAL AND METHODS

Complete larynges were surgically removed from 10 patients with laryngeal carcinoma; none of them had had X-ray therapy. The epiglottis were examined and proved to be free of pathological lesions.

The samples were removed from the laryngeal and lingual side of the epiglottis and fixed in 2.5% glutaraldehyde in 0.1 M buffered cacodylate, postfixed in 1% osmium tetroxide, dehydrated in acetone and embedded in Epon 812. Ultrathin sections were cut using a Reichert-Imy Ultracut ultramicrotome and stained with uranyl acetate and lead citrate. Electron microscopy was performed with a Zeiss EM/10 CR.

## RESULTS

In the stratified epithelium of the laryngeal surface of epiglottis numerous free nerve endings were observed. They were distributed in the basal and intermediate layers of the epithelium, and none were seen in the most superficial layers. Generally, these nerves were approximately 2.5 to 3μm thick and appeared incrusted between the epithelial cells. The nerves contained abundant mitochondria, filaments, clear vesicles and, occasionally, granules with a dense core and a clear peripheral halo, although these were not very abundant (Fig. 1).

The nerve endings appeared associated with clear cells with an irregular nucleus of lax chromatin and sometimes with an evident nucleolus. These cells also had abundant mitochondria, rough endoplasmic reticulum, microtubules and granules with a dense core. They had an extended morphology and were clearer than the rest of the cells of the epithelium. Moreover, these cells seemed to be associated with one another taking the shape of groups, like little corpuscles.

Other clear cells were found to be irregular with an irregular nucleus and with abundant finger-like projections from the cytoplasm. They contained a great number of dense-cored granules mostly in or near the projections (Figs 2, 3).

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