

Comparative Histological Study of the Oesophagus of Mammals

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ABSTRACT

The mucosal layer of all four animals in the present study consisted of three layers. This layer probably lines all organs that communicate outside the body and may have protective and to some extent secretory in function. In this study the thickness of the mucosa increased gradually in goat and cow. The muscularis extrema comprised of striated muscle fibres in the upper end and smooth muscle fibres in the lower end in human. In dog and cow skeletal muscle fibres were present throughout the length of the oesophagus. The serosal layer consisted of connective tissue fibres in all four mammals.

Key words: Oesophagus, Digestive system, Serosal layer

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MATERIALS & METHODS

Study design

Collection of specimens

Oesophagus of human was collected from cadavers, from the Department of Anatomy of Sree Balaji Medical College and Hospital Chrompet, Chennai. Oesophagus of goat and cow was collected from slaughterhouse. Oesophagus specimens of dog was obtained from, dogs died of road accidents. Six animals of each species were utilised for the study. Tissues, from upper and lower end of the oesophagus were taken.

Fixation and processing of tissues

The collected oesophagus tissues were fixed in 10% formalin solution for one week. Processing of the specimens into paraffin blocks were prepared as per the standard technique of dehydration in ascending grades of alcohol, clearing in xylene (3 changes) and finally impregnation and embedding in molten paraffin wax.

Cutting of sections

5 micron serial sections were floated in water bath and taken onto pre cleaned slides. These were then incubated in 58°C in oven for five minutes, before staining.

Staining with haematoxylin and eosin

The slides with thin sections of tissue was again preheated, then descended using xylene (3 changes) , grades of alcohol , rinsed in tap water for 5 minutes until water runs off evenly , stained using Harris haematoxylin for 15 minutes , gently washed in running tap water to

INTRODUCTION

The oesophagus, as the gullet is a straight tube that extends from the pharynx to the stomach and serves as a food pipe. The architecture is that of a typical hollow organ with four layers mucosa, submucosa, muscularis extrema, and serosa/adventitia.

The basic structure of the mammalian oesophagus is well established, many years ago. Much research is performed to carry out the study the origin of adult and highly differentiated structures from an already existing simple types [1-4].

The study of internal structure of animals will enlightens about the establishment of broad historic relations also about the path of the development of the race. The basis of mammalian digestive tube is same from oesophagus till anus.

The species variation known to occur involves mainly the lining epithelium, glands that secretes mucus. The presence, number and distribution of the mucus secreting oesophageal glands in the submucosa are said to vary considerably in different species.

Hence the present comparative study on the histological features of oesophagus of mammals such as human, goat and dog were undertaken.

wash the excess haematoxylin stain . Then eosin stain is used for 2 minutes, washed in tap water for 5minutes then ascended with acetone (2 changes) and xylene (3 changes), finally mounted using DPX.

Van Gieson's method for collagen fibres solution

- Haematoxylin.
- Solution A
- Haematoxylin - 1g Alcohol 95% - 100ml.
- Solution B.
- Ferric chloride 29% aqueous-4ml Hydrochloric acid concentrated-1ml Distilled water-95 ml.

Working solution

Equal parts of solution A & B.

Vangieson's solution

Acid fuchsin 1% aqueous - 2.5ml

Picric acid-saturated aqueous - 97.5ml

Oesophagus of human, dog, and goat were collected for the study. Six animals are used for the study. The collected oesophageal tissues were fixed and stained for histological studies. Thickness of different layers was measured using ocular and stage micrometre.

RESULTS

The histological examination of human oesophagus shows that the thickness and stratification of the epithelium was observed to be more in the upper end of

the oesophagus when compared to that of the lower end (Figure1A). Many peg-like protrusions of the lamina propria indented the epithelium. In the oesophagus of dog, the height of the longitudinal folds appeared to be uniform in upper end as well as the lower end. The lamina layer was composed of evenly distributed connective tissue fibres. In the submucosal layer, the mucous alveoli were formed of cuboidal cells with distinct cell boundaries (Figure 1b). The epithelial layer of goat samples was comprised of keratinised stratified squamous epithelium which rested on a basement membrane and the submucosal glands were absent throughout the length of the oesophagus (Figure 1c).

The arrangement of structural components in the oesophagus of mammals is depicted in Table 1.

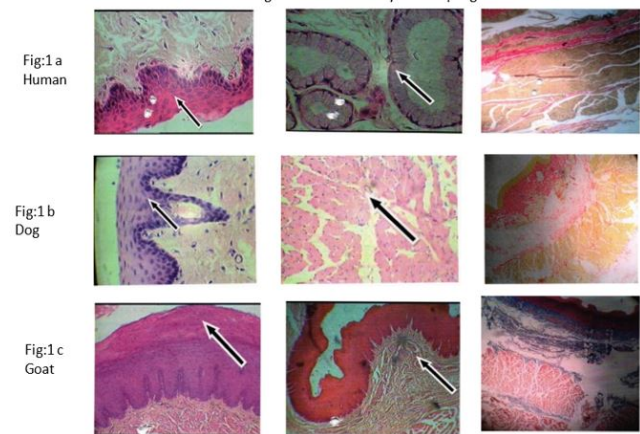


Figure 1: Microanatomy of oesophagus.

Table 1: Structural components of oesophagus.

	Epithelium	Muscularis mucosa	Submucosal glands	Muscularis externa
Human	Non keratinized	Continuous and thick	Few and scattered	Striated in upper end and smooth muscle in the lower end
Dog	Non keratinized	Complete and distinct	Numerous	Striated muscle fibers throughout the length
Goat	Keratinized	Discontinuous in some areas	absent	Striated in the upper half and smooth muscle near the cardia

DISCUSSION

Oesophagus at two levels upper and lower end of all 3 mammals was compared under light microscope [3-6]. The muscularis mucosa was composed of smooth muscle fibres but its arrangement and distribution varied in all three animals. In the submucosa the submucosal glands were absent throughout the length of the oesophagus of goat. The glands were numerous in dog and decreased in human [6-10]. The serosal layer consisted of connective tissue fibres in mammals. The present study at light microscopic level provides scope to study it under ultra-structural level. By understanding the varies layers of the oesophagus and correlating it with its function and physiology can form basis for comprehending any pathological variation in each individual layer.

CONCLUSION

Although studies have been made on the oesophagus in all species. Histological structure of different regions of the oesophagus varies widely among species, depending upon their physiological activities and the type of ingesta and this form base for the present study. The present study at light microscopic level provides scope to study it under ultra-structural level. By understanding the varies layers of the oesophagus and correlating it with its function and physiology can form basis for comprehending any pathological variation in each individual layer Thus the present study may be useful for clinicians especially in understanding the etiology of tumours in the oesophagus with respect to food habits. Comparative histological study in mammals, like the present study can be supportive and useful for surgeons for xenografting.

FUNDING

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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