Teaching Gross Anatomy of the Animal Intestine using a 3-Dimensional Model

Leena Chandrasekhar1*, Reghu Ravindran2, V.S.Pramod3, George Chandy4 and J.J.Chungath5

College of Veterinary and Animal Sciences, Pookode, Lakkidi- 673576, Wayanad, Kerala, India.

Kerala Veterinary & Animal Sciences University

Present address: 1Assistant Professor, Department of Veterinary Anatomy, 2Assistant Professor, Department of Veterinary Parasitology, 3Artist & Student (3rd B.V.Sc & A.H) 4Assistant Professor, Department of Veterinary Surgery 5Professor and Head, Department of Veterinary Anatomy.

College of Veterinary and Animal Sciences, Lakkidi PO, Wayanad, Kerala 673576.

Received: June 2015 ; Accepted: October 2015

ABSTRACT

An anatomically precise teaching model of the animal intestine was constructed and used in this study. A survey of student scores on overall realism and usefulness of the model was conducted. Students could easily understand the gross anatomy of the animal intestine and its topographical relations when taught using the model in combination with conventional teaching methods.

Key Words: Teaching, Intestine, Anatomy, 3-D model.
The structure of the animal intestine in relation to body cavities is complex and variable. Conventional teaching of intestinal anatomy using charts (2D), videos and lecture notes do not provide a holistic view of the anatomy of the intestine. Problems in the storage of the entire organ with topographical relations intact adds to the difficulty. The inception criteria of this study was the difficulty in teaching anatomy of the intestine with conventional methods.

Intestinal affections like obstruction, intussusception, and congenital problems like atresia ani account for a higher percentage of the reported surgical conditions in animals. Post-operative complications of intestinal surgery can result in a mortality rate of 80%. Colic is one of the most common problems in equine practice and has a significant economic impact on the racehorse industry (Parry, 1986; Smith, 2002 and Singer, 2002). Surgical correction of intestinal ailments require a thorough knowledge in the 3D orientation of the intestine.

Mahadevan and Chandak (2013) opined that the anatomy of the perineum and pelvis is complex and those people working outside the specialist fields of colorectal surgery have a limited understanding of the anatomical details of this region. Bogduk, 1996, suggested that surgeons should recognize that anatomy is not a static science and that idealized descriptions that occur in textbooks do not necessarily reflect actual anatomy. Ruskin and Pearl (1990) described the need to construct a life-sized and anatomically accurate prototype model of the intestine along with its relations. In this manuscript, the use of a simulator of the animal intestine and evaluation for its pragmatism and utility are described.

**MATERIALS AND METHODS**

A simulator of the animal intestine was prepared using flexible iron rod (2-3 mm diameter). The rod was bent according to the length of the intestine (to scale) and its parts as mentioned by Konig and Liebich, 2009. The bent rod was placed into an already mounted animal skeleton. The flexures and bends were corrected in order to bring them in close realism to the animal’s actual topographical relations and depth settings after observation and video recording of the postmortem of particular animal species. The rod was removed from the skeleton and covered with padding cloth so as to make the body and approximate diameters to scale. Papier-maché was used to cover the cloth and finally acrylic was used for the finish. Different parts of the intestine were marked and color coded. After drying, the model was adapted into the animal skeleton.

Ninety students were divided into two groups. Half were taught with the model and rest half without the model by conventional teaching methods using charts and lecture notes. After the session, the students were asked to rate the realism and usefulness of the model on a five point Likert scale (1-not realistic and useful and 5 very realistic and useful). Anatomical similarity, material used, spatial relationships, color and design were used for the overall score. Two way analysis of variance (Snedecor and Cochran, 1994) was employed to study significant effect of the batch and the application of the simulator.

**RESULTS AND DISCUSSION**

It was observed that students could replicate the structural details of the animal intestine with ease along with its topographical relations when taught with the simulator followed by the conventional lecture. Results of the comparison of student attitude towards traditional teaching and teaching using the model showed highly significant difference (P(<0.01). The results strongly suggested that 3 D models were effective to teach anatomy of the animal intestine.

The motivation in the preparation of this model was the difficulty in teaching anatomy of the animal intestine using 2 D pictures, videos and lectures and also the importance in knowing the correct anatomical position and relations of the intestine while performing surgery. Unavailability of anatomically correct models of the animal intestine in India and the cost involved in importing models from abroad were also the contributing factors. Even a two sided dissection of the peritoneal cavity disturbs the actual anatomical position and fails to explain satisfactorily the anatomy of the flexures of the intestine occurring at the midline. Storage of adult animal carcasses with topographical relations intact is difficult.

Coskun et al. (2007), Dobson et al. (2003) and Noakes et al. (2006) used techniques of geometrical modelling and also constructed simulators to teach anatomy of the human intestine in relation to its topographic location. This is a first attempt to construct anatomically correct models of animal intestine in our country. The model was constructed with the help of student artists. Approximate cost in preparation of this simulator was only rupees 1000/-. The opinion of practising surgeons were sought regarding the usefulness of the simulator as an educational tool to suit the needs of Veterinary Surgeons. Mounted animal skeletons of domestic species are available at all leading Veterinary Institutes and supplementing models of the intestine for each species is feasible and could be undertaken as a part of the teaching programme. In later stages of development of this model, data obtained from imaging techniques at different cross sectional levels can be combined to help the student to study anatomy with a clinical approach.

**REFERENCES**


