A Three-Dimensional Animated Model of Abomasal Displacement and Volvulus

André Desrochers, *DMV, MS, Diplomate ACVS*[1,2]; **Denis Harvey,** *DMV, MSc, PhD*[1,2]; **Félix Roy,** *BS*[2]
[1]*Department of Clinical Sciences*
[2]*LITIEM*
Faculté de médecine vétérinaire, Université de Montréal, St-Hyacinthe, Québec, Canada J2S 7C6

Introduction

Displacement and volvulus of the abomasum is commonly seen by every bovine practitioner working in a dairy practice. Understanding the anatomy and position of the abomasum is now second nature for people with experience. Veterinarians have to remember their old days in the classroom when the teacher was trying to explain how the abomasum was moving around in the abdomen. It takes a lot of experiences, sometimes acquired the hard way, to understand the topography of abomasal displacement or volvulus. Three-dimensional (3-D) modelization and animation have been used in movies and videogames for a while. Recently, the advances of software and computer capacity have enabled more complex animation with non-geometrical form, like organs of living species. The resulting computer-generated images have progressed so significantly that they are not easily distinguished from reality. Three-dimensional (3-D) modelization and animation is a useful tool to explain complex phenomena, and abomasal volvulus is one of them. Our goal was to create a 3-D model of abomasal displacement and volvulus as a teaching tool for veterinary students.

Material and Methods

Using cadaver specimens, anatomy drawings and surgical expertise, a 3-D model of the cow gastrointestinal tract was created with the Softimage software (SOFTIMAGE | XSI v.1.5) (www.softimage.com). Softimage is a 3-D animation system designed for artists that has been used principally for special effect in movies and video games. The 3-D model was created by a 3-D artist (FR). The first step was to create a 3-D model of the abdominal viscera within a cow. The topography of the organs was validated by anatomists and surgeons. The second step was to create realistic textures on the different organs. High resolution digital picture and scan of viscera were performed and integrated in the model. Finally, the model was animated based on literature and surgical findings. The animations produced were abomasal volvulus and its reduction, left displaced abomasum and its reduction, toggle pin placement and some of the technical errors associated with it.

Results and Conclusion

The creation of the 3-D cow gastrointestinal tract was a team work between anatomist, 3-D artist and surgeons. The most difficult task was to agree on how the volvulus exactly occurs. Our model is based on literature and surgical findings during the ongoing project. We raised more questions than solutions to explain what exactly happens to the abomasum during the volvulus. Because an experimental model of abomasal volvulus is not possible, it is difficult to verify our hypothesis. The abomasum 3-D model is a powerful teaching tool for the veterinary student and practitioner with the desire to improve or understand a surgical technique. With this model, we can explain a difficult pathophysiology or show a non-visible action during a surgical procedure like left displaced abomasum or volvulus.