A MODIFIED TECHNIQUE FOR ABOMASAL AND Rumen CANNULATION

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In recent years there has been considerable interest in the cannulation of various regions of the digestive tract of ruminants as a research tool in nutritional studies (Johnson, 1966). Dougherty (1955) and Markowitz, Archibald and Downie (1964) described the application of rigid plastic cannulae. Stewart and Nicolai (1964) and Stewart (1967) used flexible gastrointestinal cannulae in ruminants. Experience with stump-type cannulas at this laboratory, particularly those made of rigid materials, has not been satisfactory. Abomasal cannulae exteriorized near the lower right costal arch are subject to undue stress resulting in necrosis, infection and leakage of digesta. This is further complicated by the possibility of cannula breakage and entanglement of infusion tubing.

Schelling (1968) reported the use of flexible small diameter silicone tubing for continuous abomasal infusions. Following is a description of the use of flexible silicone medical-grade tubing for rumen and abomasal cannulae which are exteriorized near the dorsal midline of the animal. The cannulae described are inexpensive and can easily be constructed in any size or length to suit particular requirements.

Materials and Methods

Abomasal Cannulae. Silicone medical-grade tubing ranging in size from 0.318 cm inside diameter (I.D.) and 0.635 cm outside diameter (O.D.) to 0.535 cm I.D. and 1.110 cm O.D. was used. All cannulae were 64 cm in length. A piece of polyester fiber mesh 1.5 cm wide was glued around the axis of the cannula 4 cm from the abomasal end of the cannula with silicone adhesive, and another piece of polyester mesh was glued 30 cm from the abomasal end (figure 1). After a 24-hr. fast, the animals were anesthetized with a general intravenous anesthetic. The lambs were placed in lateral recumbency; the surgical area was shaved and scrubbed. Using sterile technique (Markowitz et al., 1964) the abomasum was exteriorized by performing an 8 cm laparotomy 5 cm posterior to the lower half of the right costal arch. A small incision was made into the antimesenteric surface of the fundic region of the abomasum and the cannula was inserted caudad 4 cm up to the polyester fiber mesh. Precautions were taken to prevent spillage of abomasal contents. A purse string was placed around the cannula at the ridge of the mesh. The part of the cannula containing the mesh was embedded into the abomasal wall by modifying the Witzel enterostomy technique (Markowitz et al., 1964) (figure 2). The cannula was placed longitudinally along the abomasum and the meshed area was buried with continuous or interrupted Lembert sutures. The abomasum was then replaced in its original position. A stab incision was made subcutaneously through the abdominal wall approximately 3 cm dorsal and slightly anterior to the working incision. The cannula was pulled through this incision with a curved hemostat. The second mesh was fastened to the facia of the external oblique muscle with small stay sutures at the point of the stab incision.

A curved intestinal clamp was inserted through a small skin incision near the dorsal midline approximately 25 cm directly above the laparotomy and pushed ventrally in the subcutaneous superficial facia to the flank incision. The cannula was then drawn dorsally through the superficial facia and exteriorized through the skin incision near the dorsal midline by traction with the intestinal clamp. After treating the incision with antiseptic powder the laparotomy was closed with four suture lines.

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8 Diabutal (sodium pentobarbital) Diamond Laboratories Inc., Des Moines, Iowa.
9 Keraspray, The S. E. Massengill Company, Bristol, Tennessee.
10 Vetafil Bengen (synthetic surgical suture). Bengen and Company, Hannover, West Germany.
Rumen Cannulae. The dimensions of the rumen cannula were 1.270 cm I.D. and 1.905 cm O.D. or 1.588 cm I.D. and 2.223 cm O.D. Both were 12 cm long. The cannula was sectioned 5 cm from one end and a 5 cm square skirt of Dacron mesh was glued between the sections with silicone adhesive. The mesh occluding the lumen of the cannula was excised with small scissors. A piece of mesh 1 cm wide was also glued around the stem of the resected cannula adjacent to the Dacron mesh skirt (figure 3).

The rumen was exteriorized via an incision in the left para lumbar fossa and incised with a small stab wound. The cannula tip was inserted, and the rumen wall was drawn up over the mesh on the axis of the cannula and secured with a purse string. The Dacron mesh skirt was fastened to the rumen with interrupted stay sutures. After the cannula was exteriorized (Douherty, 1955), the skirt was sutured to the peritoneum.

The abomasal technique was used for cannulating the rumen in animals where only infusion of solutions was desired. Only small diameter tubing was used in this instance.

Discussion

Postoperative care consisted of administering an antibiotic\textsuperscript{11} daily for the first 5 days. Antibiotic powder was applied around the base of the cannulae once a week for 6 weeks. Small diameter catheters were flushed once a week with warm water. All cannulae were capped with corks. The lambs were maintained in wooden metabolism crates.

\textsuperscript{11} Combiotic, Chas. Pfizer and Company, Inc. New York 17, New York.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Diagram of abomasal cannula.}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Abomasal cannula at the stage of the Witzel enterostomy.}
\end{figure}
Silicone medical-grade tubing has been shown to be inert and non-reactive to body tissue (Dow Corning, 1968). Dacron polyester fiber mesh on the other hand is an irritant and elicits a rejection response by the animal body. Harrison, Swanson and Lincoln (1957) observed complete encapsulation of Dacron mesh by fibrous connective tissue at 14 days.

Postmortem examination of animals prepared by this method showed that connective tissue had completely encapsulated the Dacron mesh which resulted in a very tight permanent seal for both cannulae. Washers were not required to keep the rumen cannula in situ since the mesh was embedded in the silicone tubing (figure 4).

To date approximately 75 weaned wether lambs weighing about 25 kg have been equipped with abomasal or rumen and abomasal cannulae. The abomasal and rumen cannulations were performed in one operation which took about three hours. Additional anesthetic was administered via a temporary small diameter jugular catheter.

In some lambs the cannulae have been in situ for over 12 months. Sherwood (1965) reported the use of indwelling suprapubic silastic catheters for bladder drainage for periods up to 6 months. The larger diameter abomasal cannulae were found to clog less frequently than smaller diameter catheters;
hence, the larger ones did not require periodic flushing. Abomasal samples were obtained easily with a small suction flask and a 50 cc syringe. Cannulae with dimensions of 0.476 cm I.D. and 0.953 cm O.D. or 0.635 cm I.D. and 1.111 cm O.D. were found to work best for withdrawing abomasal fluid or infusing protein slurries. The materials used for these cannulae were inexpensive.\(^\text{12}\)

**Summary**

A technique of cannulating the abomasum and rumen of sheep using Silastic tubing is described. The abomasal cannula was exteriorized near the dorsal midline of the animal which tended to minimize problems associated with continuous infusion or sampling.

\(^\text{12}\) Abomasal cannula, $0.75; rumen cannula, $2.50.

**Literature Cited**


