

# Using a modified gastropexy technique to prevent recurrence of gastric dilatation-volvulus in dogs

These researchers studied 132 dogs treated with a modified circumcostal antral wrap gastropexy after GDV. The technique succeeded in almost all cases, and the modification took less time and had fewer complications than the original technique.

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GASTRIC dilatation-volvulus (GDV) usually occurs in large, deep-chested dogs and is often an acute, life-threatening condition. The exact cause of GDV remains unknown.<sup>1</sup> The complex pathophysiology and the medical treatment of GDV have been discussed elsewhere.<sup>2</sup>

Numerous surgical techniques have been developed to reduce the rate of GDV recurrence, which is estimated to be as high as 80% in cases in which a gastropexy technique has not been performed.<sup>3,4</sup> In the 1970s, a tube gastropexy technique was commonly used.<sup>4</sup> In the 1980s, the incisional gastropexy and circumcostal gastropexy techniques gained popularity.<sup>5-8</sup> More recently other muscle flap techniques, such as belt-loop gastropexy, have become popular.<sup>9</sup>

Circumcostal gastropexy has remained the favored technique by

some surgeons because of its superior strength,<sup>10,11</sup> but the procedure is time-consuming and can result in serious complications, such as perforation of the stomach and diaphragm.<sup>8,12</sup>

This article describes and illustrates a modification of the circumcostal gastropexy that eliminates some of the disadvantages of the original technique. We also provide the results from 132 cases of spontaneous GDV in which this modified technique was used.

## Materials and methods

The medical records of 254 dogs with spontaneous GDV presented to the Gregorio VII Veterinary Hospital between 1987 and 1996 were reviewed. Animals that received the modified circumcostal antral wrap gastropexy and had adequate follow-up from either hospital records or owner conversations were included in the study. Of the 254 cases reviewed, 132 met the inclusion criteria for this review.

On initial admission, all dogs were treated for hypovolemic shock, existing electrolyte imbalances, and cardiac arrhythmias. Decompression through gastrocentesis with an 18-ga needle was done, followed by gastric lavage with warm tap water through an orogastric tube. Surgery was delayed until cardiovascular stabilization was achieved. Six surgeons with widely varying experience performed the gastropexies. Postoperatively, owners were contacted by telephone and

questioned about the dogs' condition, feeding regimen, and physical activity as well as the occurrence of vomiting or other gastrointestinal signs and dilatation or GDV recurrence.

## Surgical technique

The patients were maintained under general anesthesia with isoflurane 1.5% and oxygen (30 ml/kg/min). Once prepared for aseptic surgery, they were positioned in dorsal recumbency for laparotomy. A skin incision was made from the xiphoid to the prepuce in males and from the xiphoid to midway between the umbilicus and the pubis in females. The subcutaneous tissue and fascia were incised, and the peritoneal cavity was entered through an incision in the linea alba. The falciform ligament was incised and retracted to the right to provide wide visualization and good access to the last palpable rib on the right and to allow adequate visibility of the diaphragmatic insertion. The stomach was derotated when necessary and evaluated for viability. Areas of questionable viability were involuted.<sup>13</sup> The spleen was evaluated for viability and removed only in cases of thrombosis. A Ramstedt operation (a longitudinal incision through the serosa and sphincter muscles at the pylorus) was then performed in all cases.

The last palpable right rib, usually

FIGURE 1

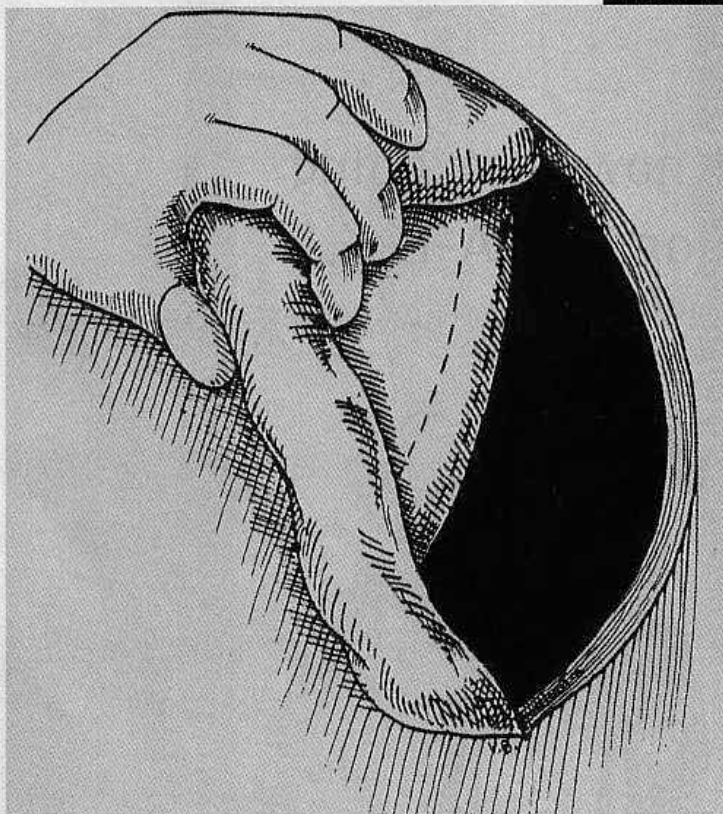


FIGURE 2

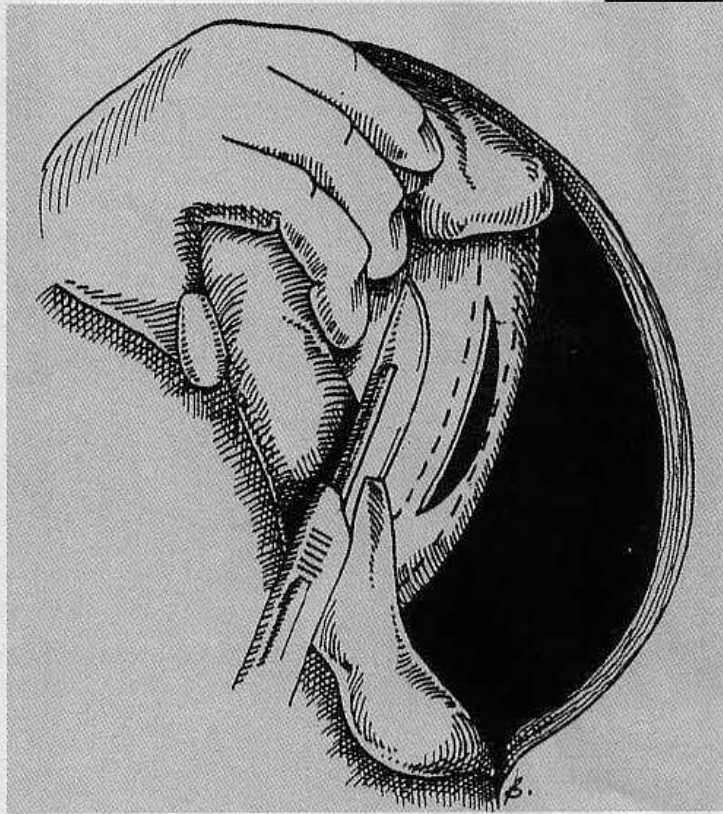


FIGURE 3

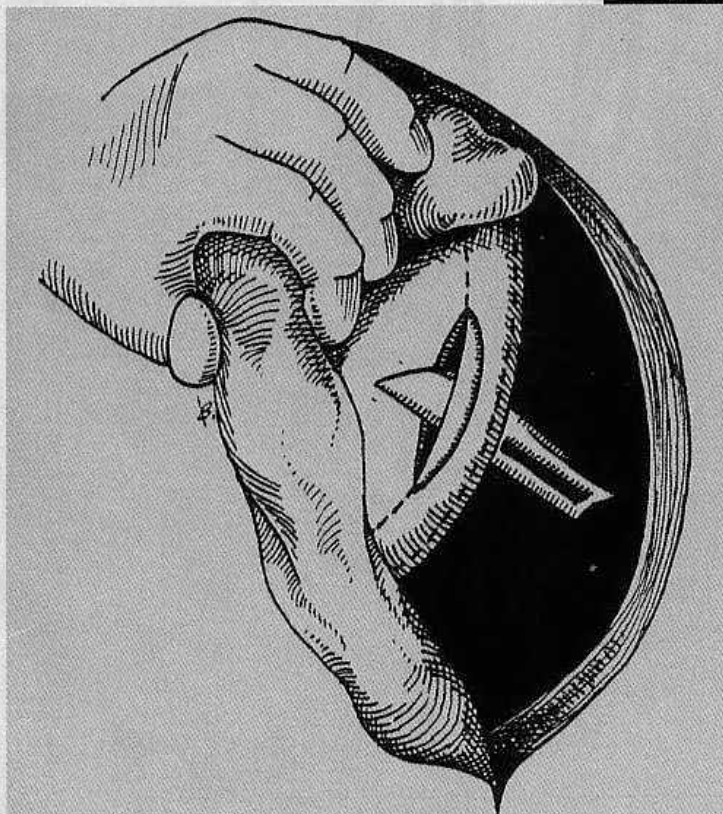
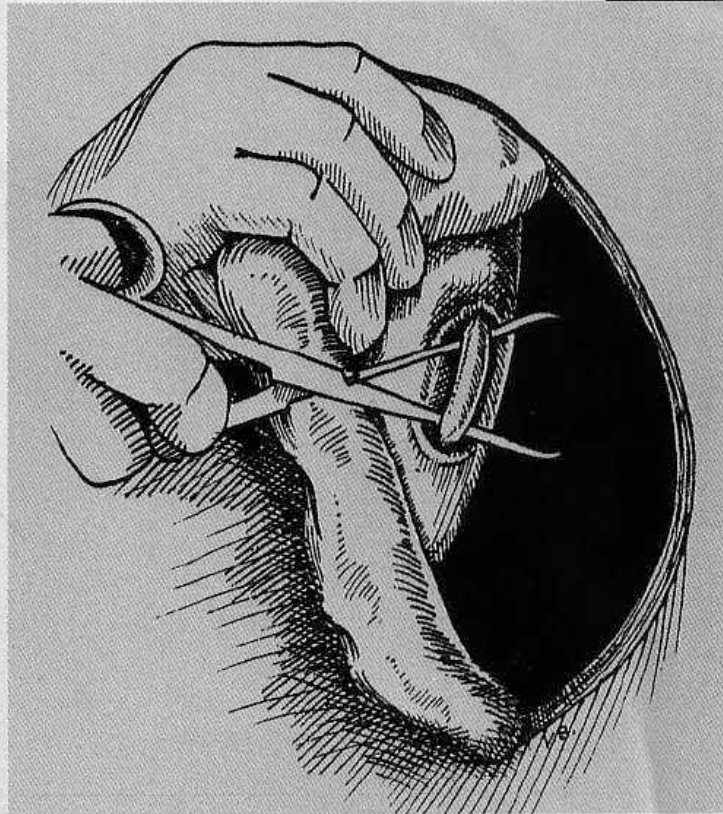


FIGURE 4



1. The linea alba is retracted with the left hand, with the thumb pushing on the ribs, so that the last palpable rib (generally the 11th or 12th rib) can be visualized. 2. An incision is made with a No. 10 scalpel blade over the last palpable rib on the right side.

3. A 3-cm-wide tunnel is made under the rib by sharp dissection with a scalpel. To avoid damaging abdominal viscera, the blade should be directed in a mediolateral direction. 4. Allis tissue forceps are inserted from lateral to medial into the tunnel under the rib.



the 11th or 12th, was visualized by reflecting the most cranial part of the linea alba and attached falciform ligament with the left hand and pulling it laterally and dorsally (*Figure 1*). This maneuver created a 4 to 6 cm distance between the linea alba and gastropexy site. A 3-cm long incision was made with a No. 10 scalpel blade over the rib through the transversus abdominis muscle (*Figure 2*). Care was taken to identify and avoid the diaphragmatic insertion. A 3-cm-wide tunnel was then created by sharp dissection around the lateral aspect of the rib (*Figure 3*). Allis tissue forceps were passed through the tunnel in a lateromedial direction, and the seromuscular layer of the stomach in the pyloric antrum region was grasped (*Figures 4, 5A, & 5B*). The forceps were then pulled back through the tunnel in a mediolateral direction, and a 3-cm width of stomach wall was wrapped around the rib (*Figure 6*). At this point, a surgical assistant held the Allis forceps with his or her left hand and the linea alba with the right hand (*Figure 7*). Then the surgeon held the Allis forceps with his or her left hand and made three or four 1- to 1.5-cm-long incisions into the serosa and the muscularis on both sides of the gastric wrap while an assistant applied retraction to both sides of the abdominal opening (*Figures 8 & 9*). The gastric wrap was then apposed using 0 or No. 1 (depending on the dog's size) nonabsorbable monofilament suture material, such as polypropylene or nylon, in a simple continuous pattern. The suture was always passed deep enough to grasp the submucosal layer on both sides of the wrap but did not enter the gastric lumen. (The mucosa slips away and is not pulled into the tunnel.) Each pass of the needle then incorporated 4 mm of the abdominal wall ventral to the rib (*Figures 10 & 11*). The continuous suture pattern consisted of five to seven passes of the needle. The average time to perform the modified circumcostal antral wrap gastropexy portion of the surgery was five minutes, with a range of three to 10 minutes. The laparotomy incision was then closed routinely.

### Postoperative care

After surgery, the dogs were fasted for 24 hours. Fluid therapy was continued, and any electrolyte imbalances were corrected. Metoclopramide hydrochloride (0.2 mg/kg b.i.d. subcutaneously) was administered for five days to reduce gastric atony. Water was not given until an animal showed some interest in food. This was usually 24 to 48 hours after surgery. A tablespoon of baby food or Prescription Diet a/d (Hill's) was offered 24 hours after surgery. If vomiting did not occur, another feeding was given after one or two hours, followed by 50 ml of water.

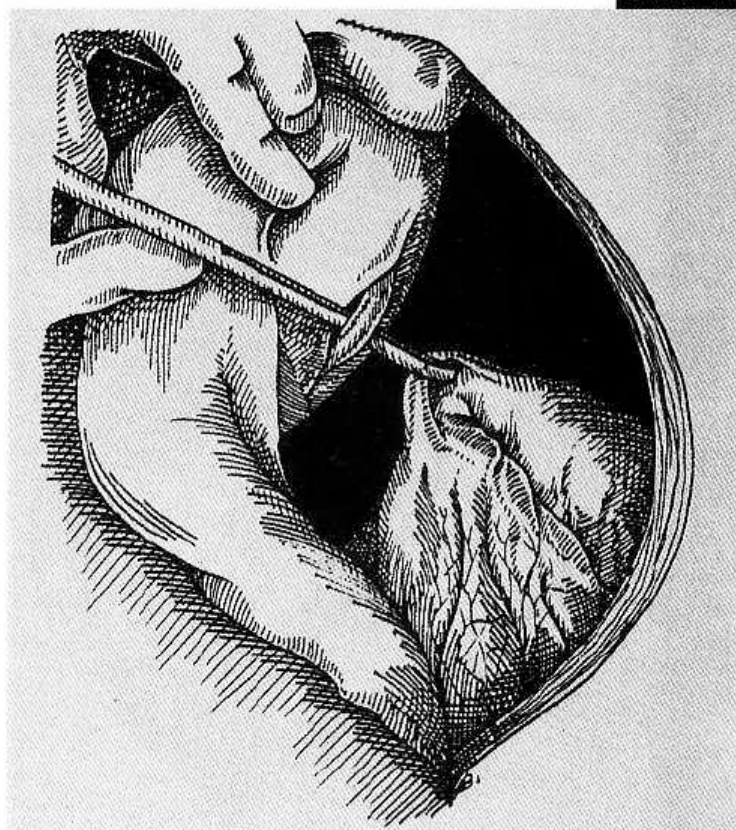


FIGURE 5A

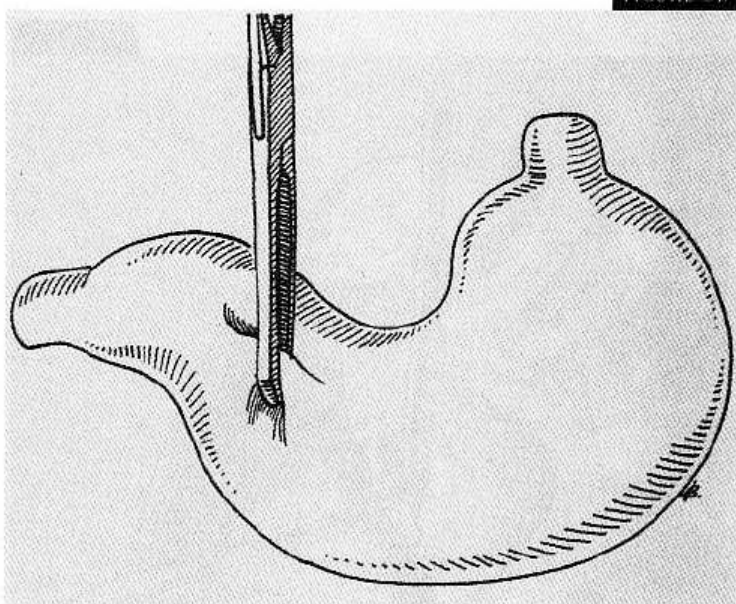


FIGURE 5B

**5A & 5B.** Allis tissue forceps are used to grasp a 3-cm-wide fold of stomach in the region of the pyloric antrum.

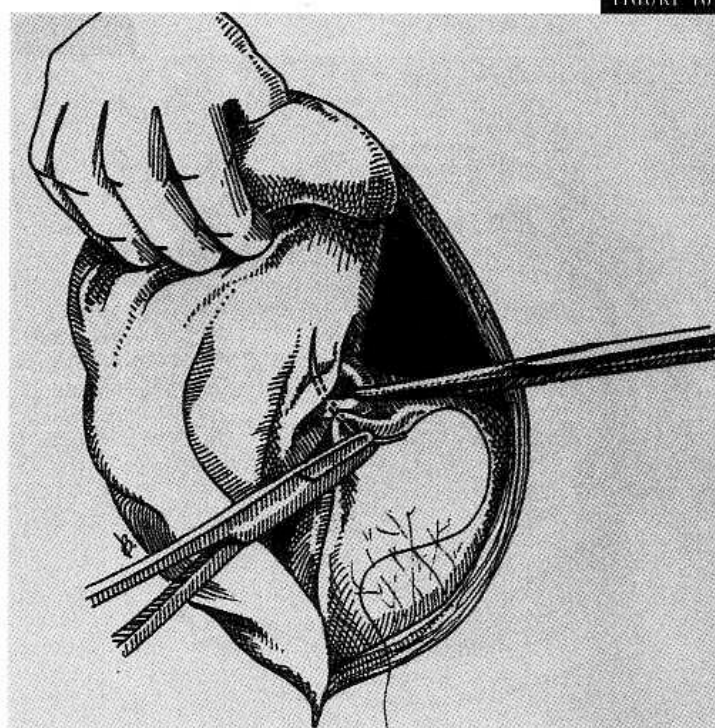
If no complications arose, the dog was discharged with instructions to feed it five or six meals a day of 100 to 150 g of soft food or Prescription Diet a/d, along with a tablespoon of honey.

For the first 10 days after surgery, it was recommended that the amount of food be increased gradually. It was also advised that the dogs be fed two or three times a day for the rest of their lives. Water was to be given in small amounts, usually 100 to 150 ml, at one-hour intervals. At the final checkup 10 days after surgery, owners were advised not to give the dogs water *ad libitum*, but rather 1 L at a time with an interval of at least one hour before and after exercising or at one-hour intervals during hot weather. This advice was to be followed for the remainder of the dogs' lives.

Histologic examination was carried out in four cases in which a dog had died from other causes. Tissue samples were collected, fixed in 10% formalin, decalcified, and stained with hematoxylin and eosin.

### The study results

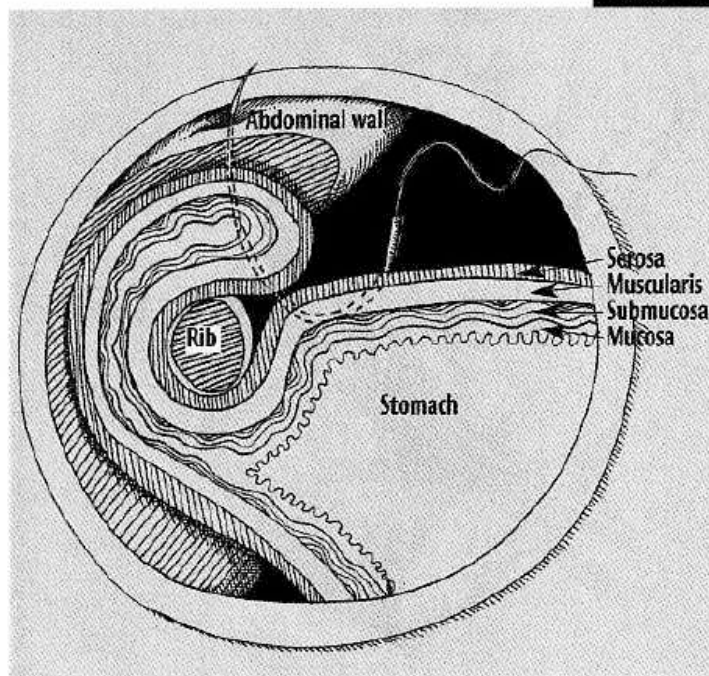
The 132 dogs were medically stabilized and taken into surgery where they underwent the modified circum-



10. The needle is passed through the stomach, the wrap, and the abdominal wall.



FIGURE 11



11. The needle is passed through the muscularis and into the submucosa of the antral wrap without penetrating the gastric lumen.

costal antral wrap gastropexy (Table 1). Of these, seven died during surgery or during the first 12 hours after surgery and were not evaluated by necropsy. Ten other dogs died during the first five days after surgery. Necropsies were performed on these 10 dogs. Figure 12 shows the gross appearance of a gastropexy site at necropsy. No signs of peritonitis, stomach perforation, or other problems associated with the gastropexy procedure were found in any of the necropsied dogs. Death in these cases was attributed to metabolic disturbances associated with the GDV and not to the surgical procedure. One dog died of complications from the surgical technique—perforation of the diaphragm, resulting in iatrogenic pneumothorax. Another dog survived surgery, but subsequently drank ad libitum from a toilet seven days after surgery. The dog was brought to the hospital, its stomach was decompressed with an orogastric tube, and 7 L of water was removed. The dog died a few minutes later. A necropsy was performed, and the gastropexy site was found to be intact.

Ninety-four of the owners said that their dogs had returned to normal. Twelve said that their dogs had returned to normal except for an increase in postprandial intestinal borborygmus and flatulence. Four other dogs were not considered to be fully normal because the owners complained that they continued to vomit about once a week.

Three dogs had a possible history of bloating after the procedure. The first dog had a single episode of dilatation 35 months after surgery, but it resolved spontaneously. It is not clear if this was a real episode of dilatation or a postprandial swelling of the abdomen that the owner interpreted as a dilatation. A second dog had several episodes of dilatation that resolved spontaneously without decompression.

A third dog had originally been presented for treatment because of daily bloating that required orogastric decompression, each time with variable difficulty. A permanent gastropexy had been performed on this animal at another clinic, and the dog seemed to improve. But after a few days, it began to bloat again. An exploratory laparotomy was then performed at our hospital, and the permanent gastropexy was found to be detached. A pyloromyotomy and modified circumcostal gastropexy were performed. The dog did not bloat for about three months, and then had another episode of dilatation that required orogastric tube decompression. The owner reported that the orogastric tube could be passed through the cardia much easier than before surgery. The dog had three other similar episodes that required decompression during the following six months.

**Table 1** Results from 132 Dogs with Spontaneous GDV Treated with Modified Circumcostal Gastropexy\*

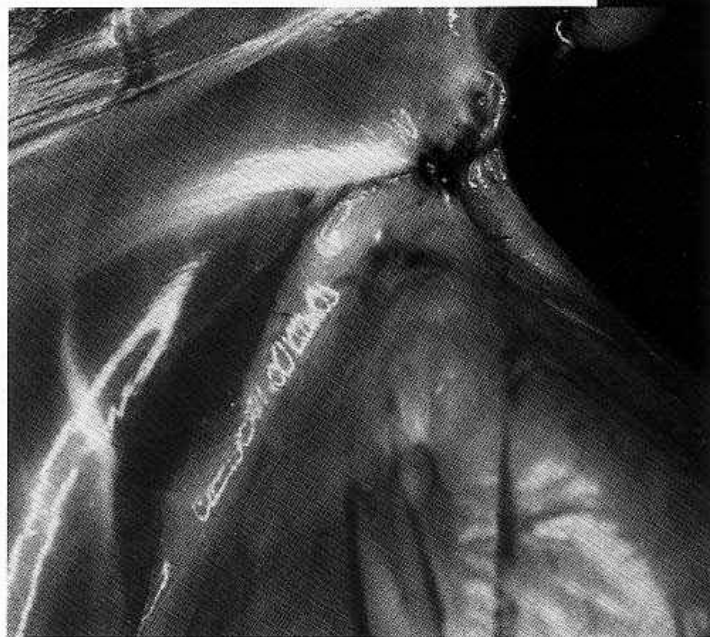
Surgical Complications (132 dogs)	Survival Rate (132 dogs)	Clinical Results (113 dogs)
128—No complications	113—Survived	94—Normal
2—Major complications (diaphragmatic perforation)	17—Died of unrelated causes	12—Intestinal borborygmus, flatulence
2—Minor complications (temporary swelling)	1—Died of dilatation after one week	4—Vomiting about once a week
	1—Died of diaphragmatic perforation	1—Single episode of dilatation
		1—Several episodes of dilatation
		1—False-alarm dilatation

\*Average follow-up time = 14 months; minimum = 1 month; maximum = 35 months.

In the group of 94 dogs that were considered to be fully recovered, there were three perioperative complications. One dog had a diaphragmatic perforation during surgery that was promptly handled with intraoperative positive pressure ventilation and repair of the perforation. The dog recovered uneventfully. Two other dogs had a painful swelling on the flank over the gastropexy site that resolved spontaneously within two to three weeks. No other complications attributable to the surgery were seen in the rest of the dogs.

About 60% of the owners complied with the feeding directions given at patient discharge. The other 40% returned to a once-daily feeding.

Results of histopathology of the gastropexy site from four dogs showed atrophy of the gastric mucosa without necrosis and a fusion of collagen fibers with fibers of the smooth and striated muscle layers. The intercostal muscle adhered to the muscular gastric wall because of a fibroblastic proliferation, without an obvious distinction between the muscular fascicles. There were also areas of neovascularization with some lymphoblastic cells aggregated within the wound (*Figure 13*).



**12.** A postmortem specimen of a gastropexy site in a 12-year-old German shepherd that died of unrelated causes (lymphosarcoma).

