Presurgical Diagnosis of Abomasal Displacement and Perforation

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Many practitioners as well as bovine surgeons at referral centers have observed an increased incidence of concurrent displacement and perforation of the abomasum in dairy cattle over the last 10 years. Adhesions between the visceral (abomasal) and parietal peritoneum make correction of the displacement difficult and, if disrupted, there is a risk of creating diffuse peritonitis. Abomasal displacement is the most common surgical condition of the bovine abdomen. Prognosis following surgical fixation in an uncomplicated displacement is excellent.[1,2] However, the additional complications worsen the prognosis when concurrent displacement and perforation exist. Therefore, presurgical suspicion of the coexisting problems is of extreme importance as this allows not only an appropriate prognosis but enhances surgical preparedness and appropriate selection of surgical site and procedure to best allow successful management.

Clinical Signs

The clinical signs that are most helpful in considering a diagnosis of concurrent displacement and perforation of the abomasum include:

1) An area of tympanitic resonance (ping) created by simultaneous percussion and auscultation of the left or right abdomen coupled with auscultation of a fluid wave when ballottement of the abdomen is performed. These are signs consistent with abomasal displacement.

2) Pneumoperitoneum leading to a ping over the upper abdomen and extending to the dorsal midline (Figure #1). Depending on the degree of pneumoperitoneum, this may be most easily detected on the right upper abdomen or present bilaterally. In cattle, the rumen tends to muffle the ping present with pneumoperitoneum on the left side unless sufficient air is present in the abdomen or unless the rumen is relatively empty. On the left side, the ping created be pneumoperitoneum must be differentiated from left displacement of the abomasum (LDA), ruminal tympany, and rumen void.[3,4]

On the right side, the ping created by pneumoperitoneum must be differentiated from the pings created by gas in the proximal colon, cecal distention, pneumorectum, right displacement of the abomasum (RDA), duodenal distention, and other less common causes of right-sided pings.[5] Rectal examination following thorough auscultation helps to confirm pneumoperitoneum and rule out other obvious causes of pings in the right and left abdominal quadrants. Pneumoperitoneum results in a distinct sensation of the rectum being tightly or snugly compressed around the examiner's arm. This compression makes palpation by stretching the rectum to grasp structures difficult and, instead, forces the examiner to merely use finger touching to identify viscera and abdominal structures.

3) Although fever is not unusual in periparturient dairy cattle having LDA or RDA that also have puerperal metritis, mastitis, or pneumonia, fever that cannot be explained by the physical examination should arouse suspicion of peritonitis. This is especially true for cattle that had prior physical examinations that included normal temperatures.

4) In our experience, cattle with perforated ulcers often manifest abdominal pain when pressure is applied over the area of inflammation and adhesions. This may be subtle and is suspected when finger pressure by the examiner is exerted in the intercostal regions over the area of ping suspected to be caused by abomasal displacement. The cow may grimace, arch up, or show avoidance behavior when the area coincident with abomasal adhesion to the parietal peritoneum is tested in such a manner. Cattle having more diffuse peritonitis may react similarly to deep palpation or pressure exerted in focal areas of the ventral abdomen. Some cattle assume an arched stance that the owner reports to be unusual. Differential di-

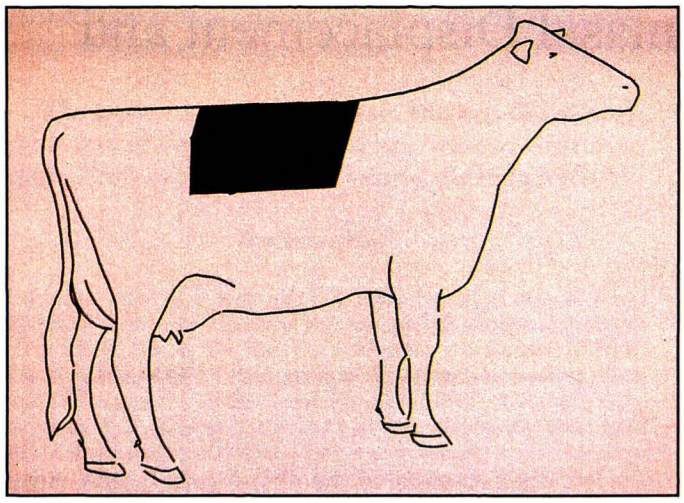

Figure 1. Schematic illustration of the region in the dorsal abdomen where a ping associated with pneumoperitoneum usually is found. The area is roughly rectangular, extends to the dorsal midline, and is associated with distention of the abdomen that causes varying degrees of expansion of the paralumbar fossa. Pneumoperitoneum usually is bilateral but frequently is more apparent on the right side.

agnosis would include localized peritonitis due to traumatic reticuloperitonitis or abomasal perforation without concurrent displacement. A small percentage of cows with concurrent displacement and perforation show signs consistent with diffuse peritonitis such as elevated heart rate, shallow rapid respirations, complete ileus, groaning upon each expiration, and toxemia. These signs indicate a guarded prognosis for life.

Most cattle diagnosed with concurrent displacement and perforation of the abomasum have LDA but a few have RDA. Unfortunately, fever and evidence of localized or diffuse peritonitis are not always obvious in these patients, and careful physical examination is necessary to detect subtle findings. The owner should be questioned as to whether the cow has had a rectal temperature recorded prior to veterinary examination, and whether it was normal or elevated. Fever may be transient and is more likely during the acute stages of perforation. Therefore, the cow may have had fever earlier but, currently, as the localized peritonitis is confined by normal body defense mechanisms, her temperature may be misleadingly normal. In addition, periparturient inflammatory diseases such as metritis and mastitis are much more common, and an elevated temperature may be attributed to these extra-abdominal infections.

Pneumoperitoneum, however, is a highly consistent sign and should be given credence when confirmed by auscultation and rectal findings. Although the magnitude of pneumoperitoneum varies greatly, if found with an abomasal displacement, it should raise a high index of suspicion for concurrent displacement and perforation of the abomasum. Other causes of pneumoperitoneum such as primary pulmonary disease, pneumothorax, and uterine rupture should be ruled out by physical examination and ancillary tests where necessary.

Ancillary Aids

When the physical examination findings of abomasal displacement and pneumoperitoneum suggest the diagnosis, further diagnostics may not be necessary. This is especially true when fever and signs of localized peritonitis also are present.

When the diagnosis is suspected but further confirmation is necessary or the owner is reluctant to have surgery until the prognosis can be better determined, ancillary aids including an abdominocentesis and vacuum aspiration of pneumoperitoneum are indicated.

Abdominocentesis, although not always successful in dairy cattle, should be attempted, either from the right paramedian abdominal area or the right caudal abdomen just lateral to the right foreuddder attachment.[4,6] Abdominal fluid obtained from these locations having a total solids value greater than 3.5 gm/dl should be considered to be indicative of peritoneal inflammation. The total white blood cell count in bovine peritoneal fluid varies greatly and is subject to great dilutional influences. Cattle with peritonitis frequently produce large amounts of peritoneal exudate that may dilute the limited numbers of neutrophils available for the inflammatory response. Therefore, although WBC counts greater than 10,000 cells/µl would be expected in peritonitis cases, the worst cases (diffuse peritonitis) may have counts less than 10,000/µl but have a high total solids >4.0 to 5.0 g/dl and abundant fluid.

Vacuum aspiration of free abdominal air when pneumoperitoneum exists may allow a more thorough physical examination less confounded by confusing pings. This allows a better assessment of the abdominal viscera, a better determination of the size and location of the displacement, and rules out other causes of abdominal distention and pings on the right or left abdomen. This can be performed easily following surgical preparation of an area in the upper right paralumbar fossa followed by needle puncture and vacuum aspiration of the free air in the abdomen.

Treatment

Once a diagnosis of abomasal displacement with perforation is made or highly suspected, the owner is forewarned of the additional potential

for complications and must decide upon surgery or culling. If surgery is elected, the ventral right paramedian approach is deemed best because it can be performed using sedation and local anesthesia and permits access to the abomasum. The adhered abomasum can be broken free from its attachments to the parietal peritoneum, and the ulcer can be identified and oversewn. Dissection of adhesions must be done in a manner that lessens the risk of abdominal contamination. The surgeon keeps the dissection as close to the parietal peritoneum as possible while avoiding enlarging the defect in the abomasal wall. Whenever possible, blunt finger dissection is used. In longstanding cases, sharp dissection may be necessary. Unfortunately, such dissection is painful, but it is virtually impossible to desensitize the peritoneum. Only rarely is general anesthesia economically feasible. The ulcer is identified and exteriorized (Figure #2). It usually is not necessary to excise the lesion; instead, it is oversewn with an inverting pattern. The area should be lavaged copiously with sterile isotonic solutions. The degree of peritoneal lavage performed will depend on the amount of contamination present. The abomasum is relocated to its normal location, and an abomasopexy is performed. Preoperative and postoperative (7 to 14 days) broad spectrum antibiotics are indicated. Systemic non-steroidal anti-inflammatory drugs such as flunixin meglumine sometimes are given preoperatively and postoperatively for one to three total treatments to stabilize the patient but generally are discouraged due to their ulcerogenic side-effects. Postoperative cattle are fed mainly hay and high fiber diets with no easily fermentable feeds added for 2 weeks postoperatively to aid healing of the abomasal ulcers.

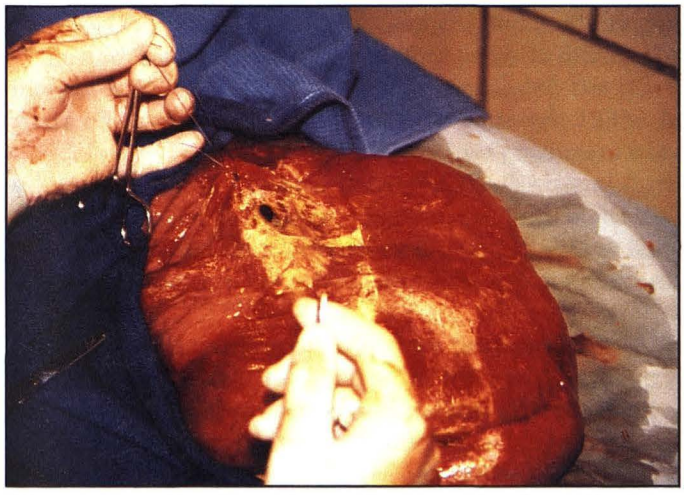

Figure 2. Perforating abomasal ulcer before oversewing. The abomasum which had been displaced to the right has been freed from the parietal peritoneal adhesions and exteriorized through a right paramedian celiotomy incision.

Discussion

The frequency of abomasal displacement in dairy cattle can cause veterinarians to omit further diagnostic considerations once a ping consistent with LDA or RDA is identified. Surgery is deemed the next likely step and a variety of surgical options exist for correction of abomasal displacement. However, if cattle thought to have LDA or RDA are also showing fever or signs of abdominal pain, or the veterinarian suspects pneumoperitoneum, a perforating abomasal ulcer should be considered.

Correction of concurrent displacement and perforation of the abomasum is best, in our opinion, performed through a ventral right paramedian incision (as described under Treatment) since this approach allows dissection of the abomasum and its adhesions to the parietal peritoneum, oversewing any perforations and exact relocation of the organ via abomasopexy. Left paralumbar fossa incisions would allow diagnosis and perhaps dissection with left-sided disorders but would make oversewing and relocation difficult. Right paralumbar fossa incisions do not permit access to the abomasum for oversewing or control of leakage. Closed procedures including toggle pin placement would not be successful because the abomasum cannot "float" to the ventral midline and thus are specifically contraindicated. A right paracostal incision permits access to the abomasum with right-sided disorders but requires restraint of the animal in lateral recumbency.

Diagnosis or a high index of suspicion for combined displacement and perforation of the abomasum avoids the surprise created when a simple DA alone is suspected, the abdomen opened, and the organ found adherent to the body wall due to obvious peritonitis. **Presurgical diagnosis also allows a better discussion with the owner regarding the chance for a successful surgical outcome, lest the veterinarian be blamed for complications and costs unanticipated to the owner who elects surgical correction for what was erroneously thought to be a simple DA.**

Although concurrent abomasal ulceration is not unexpected in chronic, long-standing or severe abomasal displacements, many cows with concurrent displacement and perforation do not have a history of chronic illness. In chronic or neglected displacements, one can easily understand the tendency for either bleeding or perforating ulcers because the organ is stretched mechanically, the mucosa thereby is compromised and stretched, and the mucosa is constantly bathed in pooled hydrochloric acid, which is likely to damage the mechanically compromised mucosa. Therefore, chronic abomasal displacement in calves, dry cows, bulls, and other poorly

observed animals predisposes to either bleeding or perforating ulcers. The reasons for the occurrence of concurrent displacement and perforation on a more acute basis in early lactation cows can only be theorized. It is possible that modern rations and other factors that predispose to both displacement and ulceration — which are common in early lactation dairy cows — contribute to this syndrome. Certainly, cases do occur in cattle other than early lactation cows. However, the majority of our cases occur during the same lactation time period as the peak of simple DA.

It is surprising that the majority of cattle affected by concurrent displacement and perforation are not "sicker" and do not show more severe signs of systemic illness. This fact helps explain why many are thought to be "just another DA" cow until the abdomen is opened. Failed toggle pin correction of simple DA can lead to a similar problem of concurrent displacement and adhesion of the abomasum to the parietal peritoneum due to leakage from the failed toggle puncture. However, most of our cases have been spontaneous and not had a history of prior toggle-pin placement attempts.

Our clinical impression is that the perforation occurs following simple displacement. As perforation occurs, gas escapes the distended organ, causing a collapsing balloon effect that creates the pneumoperitoneum. This collapse and pressure release is probably life- saving to the cow in many instances since the organ is displaced rather than in a normal ventral abdominal location — thereby decreasing the release of chemical and bacterial contaminants in the abdomen. The quantity of released fluid and bacteria largely determine the degree of peritonitis present. When minimal to moderate, the rapid fibrin deposition at the site causes the initial fibrinous adhesion of abomasal visceral peritoneum to parietal peritoneum. These fibrinous adhesions quickly expand, enlarge, may become fibrous, may involve omentum, may allow abscess formation, and ultimately present the surgeon with a remarkable challenge in safely separating the abomasum from parietal peritoneum lest contamination and leakage occur from the original perforation or from rents in the abomasum as adhesions are broken down.

When large amounts of abomasal contents in addition to gas escape into the abdomen, diffuse peritonitis occurs, and the cow would be likely to show severe systemic signs of illness due to peritonitis. Although RDA with concurrent perforation is much less common than LDA with concurrent perforation, it is our impression that cows having RDA plus perforation may be more likely to have diffuse peritonitis. It may be theorized that the rumen is both a force and somewhat of a blockade to movement of the displaced abomasum on the left while the right abdomen presents no such physical barriers to fluid leakage and thus allows more contamination.

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