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Management of Abomasal Displacement

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Displacement of the abomasum is a relatively common condition in the dairy cow. Left-side displacement is the most common abnormality, and although right-side displacement also occurs, it is more often an abomasal dilatation. The dilatation may proceed to an abomasal volvulus, which is an immediately life-threatening condition. The pathogenesis of abomasal displacement is incompletely understood; however, most authorities believe a low-roughage, high-carbohydrate (CHO) diet during the immediate prepartum period predisposes animals to abomasal displacement. This issue of *Large Animal Veterinary Rounds* reviews the factors thought to predispose animals to abomasal displacement and provides an in-depth description of surgical approaches for correcting abomasal displacement.

Abomasal displacement is predominantly a condition of the dairy cow, although the condition is also infrequently observed in bulls and beef cattle. There is general agreement that higher producing cows are at increased risk and there are further suggestions of a heritable component.[1,2] The typical abomasal displacement occurs within 6 weeks of calving. In North America, the incidence of the condition is highest in winter, when cows are generally in confinement. Factors that may predispose to the development of abomasal displacement are: high-CHO, low-roughage diets, especially during the immediate prepartum period; high-milk production; and exercise restrictions.

Left-side displacement, the most common abnormality, is readily resolved using a number of surgical techniques, including right-side omentopexy and a variety of abomasopexy techniques. Right-sided displacement may often be more of a dilatation than a displacement and is routinely managed similarly to left-side displacement. Abomasal volvulus probably represents a progression from dilatation; it is an immediately life-threatening condition that most surgeons approach through a right paralumbar fossa celiotomy.

Pathophysiology of abomasal displacement

Although the pathophysiology of abomasal displacement is not completely understood, many consider that the high levels of volatile fatty acids in the abomasum resulting from low-roughage, high-CHO diets of the immediate prepartum period are implicated. Volatile fatty acids suppress abomasal wall tone and motility leaving the abomasum susceptible to dilatation. With parturition, there is an instantaneous loss of abdominal fill, not only is the uterus now empty, but this result is compounded because rumen fill is reduced during late pregnancy. As a result, the dilatation-prone abomasum distends with gas and readily displaces in the temporarily spacious abdomen. In the case of left-side displacement, once the abomasum is on the left side of the rumen, the gas distension serves to trap it in that position. Hypocalcemia probably exacerbates the abomasal atony, and cows suffering from metritis or mastitis may be slower in refilling their underfilled rumens due to depressed appetites.

The biochemical abnormalities that develop are secondary to decreased abomasal transport. Cows with either left- or right-side displacements frequently have normal biochemical profiles, although some may be mildly hypochloremic with mild metabolic alkalosis. If measured, the urine may have an acidic pH and many cows are ketotic. Cows with abomasal volvulus are severely hypochloremic and have an early metabolic alkalosis. With the progression of the disease, systemic and peripheral perfusion inadequacies result in the development of metabolic acidosis and cardiovascular collapse.

History and clinical signs

Most astute dairy producers will note a sudden and significant drop in milk production. Cows with simple displacements have decreased appetite and reduced fecal production. Cows with abomasal volvulus may show signs of acute abdominal pain early in the course of their disease; simultaneous auscultation and percussion of the abdomen is used to make a definitive diagnosis. Cows with left-side displacement will

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have tympanic pings over the area of the left paralumbar fossa and cranially toward the diaphragm. Cows with right-side displacement have a ping over the right paralumbar fossa and cranially toward the diaphragm. The presence of succussion fluid sounds on the left side of the abdomen further substantiates the presumptive diagnosis. The primary differential on the right side is cecal dilatation or cecal torsion.

Rectal palpation is generally unremarkable in cows with left-side displacement. Depending on the degree of distension, a gas-filled viscus may be palpated on the right side of cows with abomasal volvulus, and cecal dilatation or volvulus. Differentiating between the cecum and abomasum can be impossible on rectal palpation; however, ultrasonic examination can allow definitive identification.[3] There is always a possibility of concomitant diseases; as a result, a complete rectal examination should include an examination of the uterus, the ureters, and the left kidney.

Left-displaced abomasum: selecting a treatment technique

Fundamental to the management of a left-displaced abomasum is returning the abomasum to its normal position. Rolling the cow is one of the simplest methods to resolve the displacement; however, due to unacceptably high recurrence rates, most techniques also employ methodologies intended to secure the abomasum in its normal position. Most surgeons consider either a right-flank omentopexy or right-paramedian abomasopexy to be the most desirable techniques. Less-invasive approaches that involve rolling, tacking, and toggling techniques are generally reserved for cows of lower economic value. Most recently, laparoscopic abomasopexy techniques have been promoted, especially for show cows and as a prophylactic approach.

Right-side omentopexy

Ideally, the affected animal is restrained in a chute to allow surgical access to the right paralumbar fossa and to offer some physical protection for the surgeon. The paralumbar fossa is clipped and prepared for aseptic surgery. Local anesthesia is achieved by using a paralumbar technique directed toward thoracic nerve 13 and lumbar nerves 1 and 2. The author routinely uses mepivacaine in deference to lidocaine with epinephrine because the latter combination can cause severe myonecrosis at injection sites.

After draping the area, a 20 cm vertical skin incision is made beginning 10 cm ventral to the vertebral transverse processes. The incision is positioned 5 cm caudal to the last rib. The external and internal abdominal oblique muscles are sharply divided before the transversus abdominis muscle, and the peritoneum is carefully opened with scissors taking care to avoid injury to the descending duodenum. Exploration of the abdomen should include palpation of the cranial abdomen on the right side, including manipulation of the reticulum to confirm presence or absence of adhesions (possible hardware). The author routinely examines both kidneys and the uterus before confirming the abomasal displacement by placing the left hand behind the omental sling and over the caudal part of the rumen to the left side. With the diagnosis confirmed, the gas distended abomasum is deflated with a needle (14 ga.) attached to a rubber or plastic tube. Deflation will occur spontaneously, but is markedly enhanced by connecting the tubing to a suction apparatus. Repositioning the abomasum is easier if as much gas as possible is removed. Returning the abomasum to the right side is accomplished by grasping the abomasal wall with the left hand and sweeping the organ down under the rumen to the normal location. During the process, the left forearm is drawn around the caudal part of rumen. Long arms are a definite advantage and those individuals may be able to resolve the displacement simply by pushing down on the abomasum and sweeping it under the rumen. Some individuals advocate returning the abomasum by placing traction on the omentum immediately ventral to the rumen; unfortunately, the omentum is often torn, compromising the eventual omentopexy.

When the abomasum has been returned to the right side, traction is applied to the omentum in a hand-over-hand fashion to bring the pyloris into view. The "sow's ear" on the omentum location is too variable to be of practical use in aiding the selection of an appropriate omentopexy site. Omentopexy must be accomplished without undue tension and, in most cows, a site 10 cm - 15 cm from the pyloris is recommended. In horses, colopexies performed with surgical gut failed, whereas colopexies performed with nonabsorbable sutures endured.[4] The author routinely used polypropylene sutures for a period of 5 years, but some cows developed delayed suture infections (3 months to <1 year after surgery) necessitating suture removal. Polydioxanone and polyglyconate sutures retain significant holding strength beyond 30 days and are absorbable. Currently, the author uses either #2 polydioxanone (PDS) or #1 polyglyconate (Maxon) to perform an omentopexy. A large mattress suture placed through the abdominal musculature at the cranioventral aspect of the incision includes a 3 cm portion of the omentum. A similar mattress suture is placed at the caudal ventral aspect of the incision. These sutures fix the omentum in position and, to augment the attachment, the omentum is included with the closure of the ventral two-thirds of the transversus abdominis muscle. Although it has not been objectively evaluated, some veterinarians consider that removal of the air in the abdomen is essential to facilitate optimal dietary intake. Compressing the abdomen from the left side is commonly recommended to facilitate removal of intra-abdominal air immediately prior to tying the suture in the transversus abdominis muscle. In the author's experience, the first layer of closure does not produce a consistent seal, but more importantly, several people have been injured by cows who object to abdominal compression. The author places a canine urinary catheter through the dorsal aspect of the first layer of closure and evacuates the abdomen using a suction apparatus immediately after the second layer of closure (internal abdominal oblique muscle) is completed. Closure of the remainder of the incision is performed in layers. To allow a tension-free skin closure, the subcutaneous tissue should always be closed in a separate layer.

Postoperative management includes nonsteroidal anti-inflammatory drugs (NSAIDs) and antibiotics in cows with concurrent diseases (mastitis and metritis). A recent report demonstates benefits from transfaunating affected cows.[5] Skin sutures should be removed 10 days after surgery, but complications include incisional infection that may be more common in cows affected with metritis or mastitis. Success rates for omentopexy have been reported to range between 86% and 90%.[6,7] Failure is presumably due to early pexy disruption or longer term failure of the adhesion. The reasons for failure have not been evaluated; however, inexperience on the part of the

surgeon has been implicated and excess tension on the omentum is a likely contributor. Suture choice is probably important in long-term failures (recurrence in subsequent lactations) when the pexy becomes elongated. Effective omentopexy prevents abomasal displacement to the left and abomasal volvulus, but it may not be effective in preventing right-sided abomasal displacement/dilatation.

Right-side pyloropexy

Failure of right-side omentopexy can occur acutely; however, sometimes the omentopexy appears to stretch, allowing displacement during subsequent lactations. Acute failures are likely due to excessive tension on the omentum owing to inappropriate siting. The cause of the apparent stretching of the omentopexy over the long term is unknown; however, the author suggests suture material choice may play a role. Surgical gut, the most popular suture choice, loses its holding power well in advance of full maturation in the fibrous tissue forming the omentopexy. Given these apparent deficiencies of the right-side omentopexy technique, some clinicians include pexy of the pylorus with the assumption that the muscular wall has higher holding power and therefore, a pyloropexy is more likely to endure. Although pyloropexy can be successful, some of the complications are: inadvertent penetration of the lumen, which can lead to abscessation and pyloric obstruction; entrapment of the ventral branch of the vagus nerve that can lead to type III vagal indigestion;[8] and type III vagal indigestion owing to inflammatory compromise of the vagus nerve. Surgical management of abcessation can be successful with drainage or, in some cases, bypass of the affected area can be achieved by anastomosing the jejunum to the abomasum. Overall, redirection procedures are generally unrewarding as well as, expensive. Cows with type III vagal indigestion rarely survive and given the seriousness of these actual complications, the author is not a proponent of pyloropexy.

Right-paramedian abomasopexy

Right-paramedian abomasopexy is suited to the management of left or right displacement of the abomasum. Other than the physical demands of positioning the animal in dorsal recumbency, the technique is less demanding than right-side omentopexy because the pexy landmarks are anatomically defined and there are no experience-related issues regarding tension across the attachment. This ventral approach is often preferred for show cows, since any potential scarring at the surgical site is less noticeable than in cases of flank incisions.

The affected animal is sedated with xylazine hydrochloride (0.05 mg/kg, IV) and cast using a double half-hitch rope. Casting hobbles are attached to the forelimbs and the hindlimbs, and the cow is positioned in dorsal recumbency and secured in that position. Utilizing a gutter in the barn or a purposed constructed "V – trough" helps to maintain the patient in dorsal recumbency. The ventral abdomen is clipped, prepared and draped for aseptic surgery.

Local infiltrative anesthesia is placed in a "horizontal L" beginning on the midline at the xiphoid extending to 15 cm to the right and then caudally. A 20 to 25 cm skin incision is made 10 cm to the right of midline, beginning 10 cm behind the xyphoid and extending caudally. The subcutaneous tissue is sharply divided and visable blood vessels are ligated before being cut. A scalpel is used to cut the external rectus fascia and the rectus abdominis muscle is bluntly separated to expose the internal rectus fascia. Scissors are used to open the internal rectus fascia and the peritoneum. In most cases, the displacement of the abomasum will have resolved with the placement of the cow in dorsal recumbency; if that has not occurred, the abomasum is located to the left of the rumen and manipulated into its normal position. Palpation of the cranioventral part of the abdomen is performed to rule out concomitant peritonitis. The author also routinely palpates the uterus before performing the abomasopexy.

The ideal site of the abomasopexy is along the greater curvature, 10 cm to the left of the attachment of the greater omentum, beginning 10 cm caudal to the reticuloabomasal ligament and extending in a caudal direction over a 15 cm length. At one point, autoclaved polycaprolactam (Vetafil or Supramid) was commonly used for pexy sutures, but suture-related complications were common and, today, most surgeons use absorbable sutures. Although an evaluation of the effect of different suture materials on the permanence of the pexy has not been performed in the cow, work with colopexy in the horse has indicated that surgical gut is a bad choice,[4] and other alternatives are used (eg, PDS or Maxon). The author begins the pexy at the cranial extent of the incision using a simple continuous suture pattern to appose the internal rectus fascia and peritoneum with the inclusion of a bite of abomasal wall. To avoid the abomasal lumen, pinch the abomasal wall and feel the mucosa slip away before taking the suture stitch. Inadvertent penetration of the lumen can result in incisional infection and the formation of an abomasal fistula. The external rectus fascia is closed with a simple continuous size #2 PDS or size #1 Maxon suture and the subcutaneous tissue is apposed with a simple continuous absorbable suture (size 2-00). Historically, the skin-suture pattern of choice may have been the horizontal mattress pattern; unfortunately, the horizontal component of that suture often results in complete vascular compromise of the included skin, which possibly results in greater discomfort and delayed healing. Today, most surgeons use a Ford interlocking or simple continuous suture in the skin; both options work well, providing the subcutaneous closure is properly placed and the primary layer (skin) is not under tension.

Postoperative management is the same as with omentopexy (NSAIDs, and antibiotics for infections), as well as the benefits from transfaunation early in the postoperative period.[5] Cows should be maintained in clean, dry housing for 10 days after surgery and the skin sutures should be removed 14 days after surgery. Postoperative complications include incisional infection, but the rate of redisplacement is generally regarded to be lower than with right-side omentopexy; however, the reported success rates are in a similar range (84% to 94%).[9-11]

Left-side abomasopexy

Cows with left-displaced abomasums can be managed using a standing left paralumbar approach. The abomasum must be displaced at the time of surgery to allow visual access during the placement of the abomasopexy suture.

The left flank area is prepared for aseptic surgery. After draping the area, a 20 cm vertical skin incision is made beginning 10 cm ventral to the vertebral transverse processes, and the incision is positioned 5 cm caudal to the last rib. The external and internal abdominal oblique muscles are sharply divided before the transverse abdominis muscle and perito-

neum are carefully opened with scissors. Again, exploration of the abdomen should include palpation of the cranial abdomen on the left side, and a routine examination of the kidneys and the uterus. The distended displaced abomasum should be visible in the surgical field or readily brought into view by applying traction to the abomasum cranially or cranioventrally to the incision. Using a 1-2 m length of suture, a simple continuous suture is placed along a 15 cm segment in the omentum-free greater curvature of the abomasum, taking care to avoid the lumen. The respective ends of the suture are maintained long and the swaged-on needle is removed and separate straight-eyed needles are threaded onto each end of the suture. The abomasum is decompressed and pushed ventral and across to the right side. While an assistant identifies the optimal exit point for each strand of the pexy suture, the surgeon carries the cranially destined suture strand armed with its needle into the abdomen and pushes the needle through the right paramedian abdominal wall (assistant pushes up to help surgeon identify the correct site). The procedure is repeated with the more caudally directed suture strand and the assistant ties the two together over a gauze roll while the surgeon ensures that nothing is trapped between the abomasum and the body wall; finally, the celiotomy incision is closed in separate layers.

Postoperative management again can include NSAIDs, antibiotics, as well as transfaunation. The abomasopexy sutures should be removed in 7-10 days and skin sutures should be removed 10 days after surgery.

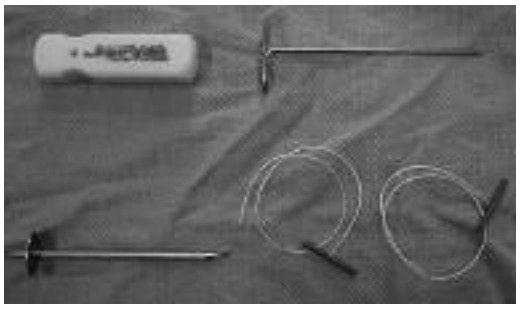
Complications include incisional infections, redisplacement after the removal of the pexy sutures, and development of an abomasocutaneous fistula. An evaluation of the permanence of this abomasopexy procedure has not been performed. The potential for pexy breakdown during wound remodelling is real, and redisplacement during subsequent lactations seems a distinct possibility.

Roll and tack: blind techniques

The roll and tack techniques include the blind stitch and several toggle techniques that are often employed when economic realities preclude open approaches. These techniques are limited to cows with displacement and abomasal distension. Cows with a left-displaced abomasum are cast onto the right side and slowly rolled to dorsal recumbency. The veterinarian must confirm repositioning of the abomasum by simultaneous percussion and auscultation over the ventral right paramedian area of the abdomen.

Blind stitch: With the repositioning of the abomasum confirmed, a large, half-curved needle is used to place a single large interrupted suture. The suture is passed blindly through the abdominal wall, into the abomasum and back through the abdominal wall before the suture is tied over a gauze roll. To avoid the development of an abomasal fistula, the suture should be removed 10-14 days after surgery. Complications include incomplete repositioning of the abomasum, inadvertent pexy of the incorrect viscus, peritonitis, and abomasal fistula, as well as a need to abort the procedure because a ping cannot be heard to confirm the position of the abomasum.[12]

Figure 1: Abomasal toggle equipment showing hand piece, trocar, push rod, and toggles



Toggle technique: Similar to the blind-stitch technique, the position of the distended abomasum must be confirmed by ausculting for a ping. The trocar is pushed through the abdominal wall and into the abomasum (Figure 1). Trocar positioning is confirmed when gas exits the trocar, the toggle is pushed into the abomasum, and the trocar is removed, leaving the end of the suture exposed. The suture end is tied relatively loosely over a gauze roll. If the suture is tied too tight, there is risk that pressure necrosis will pull the toggle through the abomasal wall. Some veterinarians place a second toggle and then tie the suture ends of the separate toggles to each other; 10-14 days after placement, the suture ends are cut close to the abdominal wall, which allows the suture to slip back into the abomasum. Similar complications occur as found with the blind stitch.

Complications of blind approaches: Blind approaches cannot be performed prophylactically because the abomasum must be distended to allow positioning of either a blind stitch or a toggle. Early publications suggested a relatively high risk of complications; these were: pexy of structures other than the abomasum, some possibly leading to intestinal obstruction; suture placement in the pyloris leading to injury of the ventral branch of the vagus nerve; peritonitis from intra-abdominal leakage of abomasal fluid through the trocar puncture; and abomasal fistula.[13-15] More recent publications suggest low-complication rates when the procedure is performed by experienced veterinarians; complication rates are higher when inexperienced operators perform the procedure.[16] Dairy producers should be fully informed that many of these complication are life-threatening; in addition, the procedures must be abandoned in up to 7% of cows because repositioning of the abomasum cannot be confirmed.[12] There is an assumption that a solid abomasopexy results from the procedure; however, the author is not aware of any report evaluating the recurrence rate of displacement in subsequent lactations.

Laparoscopic abomasopexy

Laparoscopic abomasopexy has been described using two distinctly different techniques. The original approach described by Janowitz[17] is a 2-step procedure that is limited to cows with left-displaced abomasum. The 1-step approach described by Newman and coworkers[18] and the ventral approach described by Babkine et al[19] can be employed independent of whether the abomasum is or is not displaced.

Laparoscopic abomasopexy: 2-step toggle technique

In the 2-step toggle technique,[17] the left paralumbar area is clipped and prepared for aseptic surgery and a laparoscope is placed into the abdomen through the left paralumbar fossa. The abdomen is insufflated with carbon dioxide (CO_2) or room air to allow identification of the displaced abomasum to the left of the rumen. The toggle trocar is inserted through the 11th intercostal space and thrust into the abomasum. A purpose-designed toggle is placed down the trocar and into the abomasum. The abomasum is allowed to decompress before the trocar is removed, and the suture attached to the toggle is pulled into the abdomen when it is released outside the abdomen. The laparoscope incision is closed with skin sutures. At this point, the cow is sedated and positioned in dorsal recumbency. The ventral abdomen is clipped and prepared for aseptic surgery. The laparoscope is inserted 7 cm caudal to the xiphoid and 7 cm to the right of midline. An instrument portal is placed 10 cm caudal to the laparoscope and the toggle suture is located and exteriorized through the instrument cannula. The abdomen is deflated and the two strands of the toggle suture are tied over a gauze roll. The toggle suture is cut close to the skin 3-4 weeks after surgery. There have been suggestions that cows return to feed and milking quicker than with open approaches; however, a comparison of this technique and right-side omentopexy concluded there was no difference between the techniques.[20] As described, this laparoscopic toggle technique is limited to cows with left-displaced abomasum.

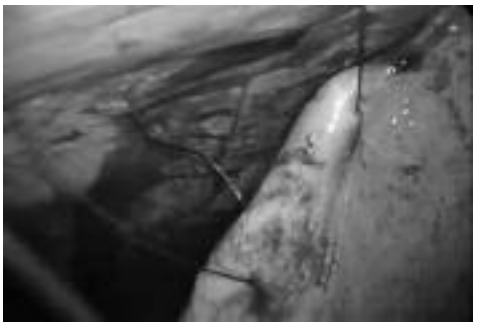
Laparoscopic abomasopexy: 1-step toggle technique

With this technique,[18] the affected cow is sedated, cast onto her right side, and rolled to dorsal recumbency (left-displaced abomasum). The ventral abdomen is clipped and prepared for aseptic surgery. Local infiltrative anesthesia is used for the laparoscope incision and the toggle cannula. A minilaparotomy incision is made and the laparoscope is inserted 5 cm to the left of the ventral midline and 20 cm caudal to the xiphoid. The abdomen is insufflated with CO_2 to a pressure of approximately 15 mm Hg. The toggle cannula is placed 5 cm to the right of the ventral midline and 10 cm caudal to the xiphoid. The abomasum is located and the toggle trocar and cannula are inserted through the toggle cannula and into the abomasum. The trocar is removed and the toggle is pushed down the cannula and into the abomasum. The abdomen is deflated and the two ends of the toggle suture are tied over a gauze roll. The purpose-designed toggle suture has a colour marker to identify the optimal tension before tying, and the toggle suture is cut close to the skin 10 days after surgery.
This procedure is well suited to cows with abomasal distention. The procedure can also be performed prophylactially; however, a second instrument portal may be needed to allow the abomasal wall to be grasped and stabilized, while the toggle trocar and cannula are inserted.

Laparoscopic abomasopexy: suture technique

To facilitate resolution of left side displacements with the suture technique,[19] cows should be cast onto their right side and slowly rolled into dorsal recumbency, which often returns the abomasum to a normal position. Again, the ventral abdomen is prepared for aseptic surgery and the laparoscope inserted through an incision at the umbilicus with insufflation to allow visual observation. One instrument cannula is inserted 7 cm caudal and 7 cm to the right of midline; a second instrument cannula is placed 10 - 15 cm caudal to the first. The characteristic identifying feature of the abomasum is the part of the greater curvature that is not covered with omentum; the pexy site is midway between the reticuloabomasal ligament and the pylorus. The abomasum is grasped with an atraumatic Babcock forceps and the abomasal wall is elevated. In the original report on this technique, 3 transverse skin incisions were made to allow placement of interrupted sutures through the abdominal wall. The author uses a 10 cm long, right-paramedian skin incision. Using either PDS or Maxon and a modified curved needle (½ curved converted to ski-tip shaped), the needle is passed through the abdominal wall and into the abdomen. The needle is grasped with a needle holder and passed through a large bite of the seromuscular abomasum layer. Then the needle is directed out of the abdomen, 2 additional sutures are placed, and the abdomen is decompressed (Figure 2). Under direct visual observation, the sutures are pulled tight, bringing the abomasum in contact with the abdominal wall and individually tied. The linear skin incision and laparoscopic incisions are routinely closed.

Figure 2: Laparoscopic abomasopexy showing three sutures in place and partially tightened



Advantages of laparoscopic techniques

Irrespective of the laparoscopic technique employed, there is visual confirmation that the abomasum is the structure pexied to the abdominal wall. The safety and the minimal invasiveness of these procedures make them an attractive alternative to other techniques, especially for valuable show animals. Although technically more demanding than the toggle techniques, the suture technique avoids full-thickness violation of the abomasal wall. The suture is not removed, ensuring a permanent attachment of the abomasum to the abdominal wall.

Abomasal volvulus

Abomasal volvulus is an immediate life-threatening condition. Right-side paralumbar celiotomy is the approach of choice for correction, and care must be exercised when entering the abdomen to avoid penetrating

the severely distended abomasum. As previously noted, any gas should be removed before attempting to return the abomasum to its normal location. In many cases, the abomasum remains severely distended and the fluid inside requires drainage before successful manipulation into a normal position can be accomplished. If sufficient abomasum can be exteriorized, decompression can be accomplished by making a 3 – 4 cm stab incision. Unfortunately, exteriorizing that much abomasum is often impossible, so drainage is achieved by placing a large bore stomach tube into the abomasum. In these cases, a purse-string suture is placed before a stab incision is made. The stomach tube is inserted and secured with the suture. Suction is applied to start a siphon and the excess fluid is evacuated. The stab incision is routinely closed using a two layer inverted suture.

Repositioning the abomasum is accomplished by pushing the craniodorsal part of the abomasum first in a ventral direction, followed by a sweeping motion in a clock-wise direction (viewed from the right side of the cow). When the abomasum is in a normal position, an omentopexy is performed. Visual assessment of the viability of the abomasum is made at the first viewing and also immediately before omentopexy. Cows with obviously nonviable abomasal tissue should be euthanized. Unfortunately, a significant number of cows with an apparently viable abomasum at surgery fail to respond to surgery. In some cases, upon re-exploration, the abomasum is found to be nonviable, the apparent victim of reperfusion phenomena. In other cases, the abomasum appears viable, but nonfunctional. Reflux of abomasal contents into the rumen is common in these cows and can be confirmed by determining the rumen chloride concentration. The definitive cause of this failure in abomasal transport has not been determined, but the most likely candidate is that the ventral branch of the vagus nerve in the area of the pylorus has been compromised by compression between the omasum and the reticulum during the volvulus. Cows not responding positively in the immediate postoperative period will require intensive management, including IV fluids and electrolyte and acid-base abnormality management; in these cases, the prognosis is guarded to grave.

Summary

Displacement of the abomasum is less common in dairy cattle under optimal nutritional management. Cows of lower economic worth are commonly managed using blind toggle techniques; however, clients must be informed of potential life-threatening complications. Cows with sufficient economic value are best managed with open surgical approaches or by laparoscopic assisted abomasopexy.

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