

Abosomal displacement and abosomal volvulus in cattle



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Abomasal displacement in cattle is the irregular positioning of an abomasum in the abdominal cavity. This paper aims to detail the factors that lead to the 2 types of displacements, left and right abomasal displacement (LDA and RDA) and the intervention and prevention of this disease complex. The prevalence of LDA is to RDA is significantly higher (Stengärde and Pehrson 2002).

Cattle are ruminants that feed on diets rich in cellulose and fiber, and they have a complex 4 chambered stomach. In an adult cattle, the rumen is the first chamber and fills up most of the abdominal cavity. It lies on the body wall on the left side of the abdomen while the rumen ventral sac stretches right of the midline. The reticulum, connected to the rumen, lies on the diaphragm. The third chamber, the omasum, is located on the right side of the cranial rumen and dorsal to the cranial area of the abomasum. The final chamber, the abomasum, is located on the right side of the rumen and lies on the ventral wall of the abdomen while the craniodorsal part of the abomasum is located in the area between the omasum and rumen.

In the normal digestive process, the abomasum of the cattle is the 4th and final stomach and lies on the abdominal floor. The position of the abomasum will differ depending on the abomasal activity, rumen and reticulum contraction, stage of pregnancy, age, and the distention of the 3 other chambers of the stomach. The cranial part of the abomasum is separated into the body and pylorus while the caudal part is covered with the lesser omentum. Food is pushed through the pylorus via peristalsis. The output of digestive material to the duodenum is controlled by the pyloric sphincter. To prevent the reflux of digestive material into the omasum, the abomasum has <https://assignbuster.com/abosomal-displacement-and-abosomal-volvulus-in-cattle/>

folds at the proximal ends. The abomasum's main purpose is for enzymatic digestion, similar to a monogastric stomach. The abomasum secretes hydrochloric acid and pepsinogen for the acid hydrolysis of microbial and dietary protein. In the small intestine, these proteins will be further digested and absorbed. The displacement of the abomasum occurs when the abomasum fills up with gas and rises from the bottom of the abdomen to the top. Due to the way the abomasum is loosely suspended by the lesser and greater omentum, it can easily shift position from the right ventral abdomen area to either the right or left. This movement will lead to the blockage of gas and food that normally moves through the gastrointestinal tract. RDA may also lead to abomasal volvulus, which the abomasum twist upon itself, cutting off the blood supply to the abomasum (Constable et al. 1991).

The aetiology of abomasal displacement and volvulus is multifactorial, factors include abomasal hypomotility and disruption of the intrinsic nervous system, but it is believed that the origin of all displacements is abomasal atony (Doll, Sickinger and Seeger 2009). It is also strongly associated with hypocalcaemia and hypokalaemia (Zurr and Leonhard-Marek 2012). Atony can be caused by a diet high in concentrates and low in roughages. This kind of diet will increase the amount of volatile fatty acids, methane, nitrogen, and carbon dioxide in the abomasum while it will decrease the motility of the abomasum. The hypomotility will stop gas such as carbon dioxide and methane from leaving the intestinal tract (Doll, Sickinger and Seeger 2009). As gas is trapped in the abomasum, it will distend, enlarge and slide to the lateral side of the ruminal atrium and the ventral ruminal sac. Then it will

float up lateral to the rumen and next to the left abdominal wall in LDA and next to the right abdominal wall in RDA.

In LDA, the abomasum will become partly bloated due to the production of gas and abomasal hypomotility (Zebeli et al. 2011). The abomasum will become buoyant and is pushed up lateral to the rumen and next to the left the abdominal wall (Niehaus 2016). The greater curvature and the fundus will first be shifted and then the duodenum and the pylorus will also be displaced. Since the abomasum moved positions, the reticulum, liver, and omasum will be pushed and rotated. The normal pathway of digestion and movement of food will be obstructed and will lead to the cattle decreasing its diet and water intake. Common conditions that accompany this type of displacement are hypokalaemia, secondary ketosis, and hypochloremic metabolic alkalosis. Decreasing water intake and feed intake is the main cause of hypokalaemia (LeBlanc, Leslie and Duffield 2005). Secondary ketosis is usually seen with this type of displacement and is also usually paired with hepatic lipidosis, which is also linked to a decreasing feed intake (Lyons et al. 2014). Hypochloremic metabolic alkalosis is a low level of chloride and a high level of alkali in the blood. Due to abomasal hypomotility, the lining of the abomasum that contains pepsins and hydrochloric acids will release these enzymes into the abomasum. The displacement will cause blockage of abomasal outflow and there will be a reflux of chloride from the abomasum and into the rumen.

Similar to LDA, the production of gas, abomasal hypomotility, and a bloated abomasum are also common features in RDA. Due to a high level of luminal gas, the abomasum will distend and push up dorsally and lie to the right of

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the rumen. In a Right Abomasal Volvulus, the abomasum will rotate on its mesenteric axis, twisting onto itself (Niehaus 2016). Standing ventrally on the right side of the cattle, the volvulus will usually be seen as a counter clockwise twist. The bloated abomasum will usually become extremely distended and the lumen pressure will increase sharply (Niehaus 2008). The high abomasal lumen pressure will decrease perfusion and without proper blood supply, the abomasal wall will become necrotic (Constable et al. 1992). The displacement of the omasum, liver, and reticulum can also be involved in the volvulus and can form a structure called an omasal-abomasal volvulus that will also limit blood supply to the omasum (Constable et al. 1991). Simultaneously, consistent secretion of hydrochloric acid into the abomasum and the reflux of chloride from the abomasum into the rumen causes hypochloremic metabolic alkalosis significantly decreasing the blood supply to the abomasum. Without a consistent source of blood supply, abomasal necrosis and acute circulatory failure will occur in the ruminant. This will quickly turn into a critical situation as the cattle may go into shock and high levels of endotoxins will be trapped in the blood leading to a high mortality rate.

There are few approaches to reposition a displaced abomasum. There is a surgical method, a medical therapy method and a percutaneous approach (Niehaus 2016). The percutaneous approach to treat a LDA involves putting the cow on its right side in lateral recumbency with both its legs tied. A veterinarian will then push and massage the ventral abdominal wall until the abomasum moves back into the ventral midline position. The cattle will then be rolled back to the left side and be allowed to stand without assistance.

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The method is quite foolproof and does not require high levels of expertise. It is also the least intervention method but it has a high LDA recurrence rate and therefore its effectiveness is limited. (least intervention, low effectiveness, high recurrence)

The medical therapy method is usually used alongside a surgical approach. Calcium ingested orally is used in this approach to treat hypomotility, hypocalcaemia, and restore abomasal motility. This will allow the abomasum to push out excess gas and allow the abomasum to return to its original position. After a surgery, parasympathomimetic agents can help stimulate gastrointestinal motility.

The four main surgical approaches to fix a displaced abomasum are right ventral abomasopexy, left paralumbar abomasopexy, right paralumbar omentopexy, and close suture abomasopexy (Niehaus 2008). The advantage of a surgical approach is that not only does the abomasum return to its normal position, but surgery also stabilizes the abomasum in that position to prevent recurring displacements in the future. Right ventral abomasopexy and right paralumbar omentopexy surgical techniques can be used on both LDAs and RDAs (Wittek, Furll and Grosche 2012). Left paralumbar abomasopexy can only be used for LDAs and late stage pregnancy cattle and close suture abomasopexy can only be used for RDAs.

In a right ventral abomasopexy, the cattle will be placed in dorsal recumbency with all its limbs in a stretched position. This will put the cattle in a stressed situation and therefore anaesthesia is usually needed for this surgical approach. The incision point will be made at the posterior side and

medial of the xiphoid process on the right side of the cattle (Niehaus 2016). The external oblique, rectus abdominis, transversus abdominis, and the peritoneum muscles will all need to be incised to get to the abdominal cavity. The abdomen can now be moved back to its correct position on the abdominal floor and the gas inside can also be released with this relocation. A fixation of the abomasum by suturing it to the abomasal wall, called an abomasopexy, will then be done. The abomasum will be sutured to the lateral margin of the incision. There will be two contact points to the abomasal wall and there is also a small risk the abomasal wall will tear in the future. This is a popular surgical method because it allows the surgeon to explore the peritoneal cavity.

Another surgical approach to fix a displaced abomasum is the left paralumbar abomasopexy. The operating site is around from the left paralumbar fossa to the right side of the ventral midline and then down to the xiphoid process (Niehaus 2008). A special anaesthesia approach called a field block may be used for this surgery. A field block is a local anaesthetic that penetrates the surrounding surgical field and leaves the area of operation uninterrupted (Dierking et al. 1992). This type of anaesthesia prevents swelling and the organ from being disturbed. A vertical incision will be made on the skin posterior to the 13th rib, and further incision through the external and internal oblique, transversus abdominus, and peritoneum will also be made to get to the abomasum. A in and out suture pattern will be used through the muscle and the greater curvature of the abomasum.

However, the omental attachments will not be sutured through. The veterinarian will place a nonabsorbable suture at the abdominal wall ventral

to the rumen while making the second suture on the right side of the midline. This process will be done a 2nd time and then the abomasum will be forced ventrally until the suture is tied. The abomasum now lies directly on the abomasal wall and the gas in the abomasum will leak out. This method is generally preferred and has a high success rate at 80% because the abomasum can be visually inspected, and any complications can be repaired immediately, however access to the peritoneal cavity will be blocked by the rumen (Niehaus 2008). With regards to cattle in late stage pregnancy suffering from LDA, this is the only surgery available as the large gravid uterus fills up most of the abdominal space and the abomasum cannot be manipulated using right flank surgery technique. Though this method is quite successful, it also requires an assistant to help guide the sutures the surgeon is making, and this will increase the cost of the surgery. This surgery is also limited to LDAs only (Niehaus 2008).

The third approach is the right paralumbar omentopexy. The cattle will be placed in a crush and anaesthetised either using a field block or 2% lidocaine at the incision point (Bean, Cohen and Tsien 1983). The vertical incision will be made at the paralumbar fossa. The paralumbar fossa is a triangular boundary that starts at the 13th rib, to the lumbar transverse process and then to the internal abdominal oblique. After the incision of the skin, both the external and internal oblique as well as the transversus abdominis will also be incised to reach the abomasum. The surgeon will insert a needle into the abomasum to release the gas and will then be pushed ventrally back to the abdominal wall (Niehaus 2016). To verify the abomasum is in the right position, the duodenum should be transverse to the point of incision and the

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pylorus should be on the left side of the abomasum. To firmly hold the abomasum in place, the omentum, a peritoneal fold, is then sutured with the incision at the 3rd gut. There are not sutures in the abomasal wall. This is also a popular surgery as it has a high success rate with a low recurrence rate and can also be done by one surgeon and therefore lowering the cost of the surgery. Risks involved are contamination of the needle that penetrates the abomasum and ulcers at the abomasum caused by trauma during the operation.

The last method is the closed suture abomasopexy. The cattle will first be put in lateral recumbency on its right side with both its leg tied together. The cattle will then be carefully rolled into a dorsal recumbency position and the veterinarian will listen using a stethoscope to the distinctive “ ping” made in the abomasum. The abomasum will then be pushed and massaged until it moves back onto the abdominal floor. At the site of the “ ping”, the veterinarian will place a suture through the adominal wall and into the abomasum. This method is the most cost-effective method out of all the surgeries as there are no incision made by the surgeon and also has a high rate of success (Ruegg and Carpenter 1989). However, this surgery requires at least 2 to 3 people to move the cattle to different positions. This surgery is also limited to Right Displaced Abomasum.

Prevention of the Left Displaced Abomasum will depend on the quality of the feeding and management program of the farm (Geishauser, Leslie and Duffield 2000). As there are no foolproof ways of completely preventing LDA, all these following methods can only lower the risk of LDA in cattle. Lead

feeding, a feeding method that increases the amount of concentrates given to the cattle 4 weeks before calving is a common practice at farms to lower LDA occurrence (Curtis et al., 1985). During the transition period, the cross sectional zone of the ruminal papillae is considerably smaller than that of a cattle at 8 weeks post-calving and therefore the ability of the rumen to absorb volatile fatty acids is considerably lower. The benefit of lead feeding is its ability to increase the absorption ability of the ruminal papillae and decrease VFAs during this critical time period that LDA usually occurs.

The size of the food particle will also play a factor in LDA prevention. In an experiment, cattle given pelleted feeds of alfalfa hay and concentrates compared to the normal sized sorghum silage were at higher risk of developing LDA. Since the food particle is too small, the ruminal forage mat is not preserved, fiber digestion reduces, and then ruminal pH will also decrease. The reduced chewing will decrease rumen motility and fill and increase ruminal VFAs. The low amount of rumen fill will give the abomasum a higher chance of relocation. It is recommended that the physical form of the feed be at an adequate size to stimulate chewing and rumen fill and any changes to the diet should be introduced gradually. Feeding a total mixed ration rather than slug feeding and keeping an adequate amount of roughage in the feed will also prevent LDA.

Slug feeding is the process where cattle ingest high amount of molasses and grain in a short period of time. This will lower the dry matter intake of the cattle and make it more susceptible to LDA. In a lot of commercial farms, overcrowding is a serious issue and limited sleeping quarters and food access will cause slug feeding. Without proper sleeping space, cattle will

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stand on concrete and may develop laminitis. Cattle that develop laminitis will decrease their dry matter intake therefore more susceptible to LDA. To solve this problem, cattle should be given adequate amount of sleeping space and increased feed access time.

Avoiding hypocalcemia during calving should also play a role in preventing LDA. A reduction in abmasal and rumen motility is usually the main cause of hypocalcemia in cattle. According to the Dietary Cation Anion Difference model, cattle can be given more anionic salts, chlorine, sulphur and less potassium at precalving to prevent hypocalcemia during birth.

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