



SURGICAL TREATMENT OF THE LEFT DISPLACEMENT OF THE ABOMASUM AN UPDATE

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1. INTRODUCTION

Left displacement of the abomasum (LDA) has been described for the first time by Begg in 1950 (Begg, 1950). The incidence of LDA on lactation level varies between 0.5% and 2.2%; in particular circumstances, it may even reach 5%. LDA mainly affects dairy cows during the first month post partum. Thereby, the abomasum becomes dilated with fluid and gas and is mechanically displaced from its normal position to the left side of the abdominal cavity, between the rumen and the left flank. In healthy cows, the abomasum is always wider than long and located predominantly to the right of the midline. In response to the expansion of the gravid uterus, abomasal length decreases and width increases during the last 3 months of gestation. The abomasum returns to its physiological position within 14 days after parturition (Wittek *et al.* 2005).

Risk factors for LDA are (among others):

- periparturient disorders such as dystocia, twins, retained fetal membranes, metritis, ketosis or milk fever,
- nutritional and management factors, and,
- breed and age (Constable *et al.* 1992; Geishauser, 1995).

A recent field study identified the following predictors of displaced abomasum in dairy cattle during the first week post partum: Retained placenta, metritis, and increasing concentrations of β -hydroxybutyrate (BHBA) and nonesterified fatty acids (NEFA) were associated with increased risk of subsequent LDA. Considered separately, postpartum serum BHBA was a more sensitive and specific test than NEFA concentration. The odds of LDA was found to be 8 times greater in cows with serum BHBA $\geq 1200 \mu\text{mol/l}$ (LeBlanc *et al.* 2005). Endotoxemia was found not to play an important role during the course of LDA, as it was rarely present in postparturient dairy cows with LDA (Wittek *et al.* 2004).

Treatment options of LDA vary from conservative treatment (casting and rolling) to surgical intervention. Casting and rolling was first described by Begg and Whiteford in 1956 (Begg & Whiteford, 1956). Permanent cure rate, however, was judged to be less than 25%. Furthermore, right torsion of the abomasum was described as a complication of casting and rolling (St-Jean *et al.* 1989). During the past 50 years a series of different techniques have been described for surgical correction and fixation of LDA. Listed in chronological order of first mentioning in literature, they include right paramedian abomasopexy (Lowe *et al.* 1965), right flank omentopexy (Dirksen, 1967), left flank abomasopexy (Ames, 1968), percutaneous toggle-pin fixation (Grymer & Sterner, 1982), two-step laparoscopic reposition and fixation (Janowitz, 1998), one-step laparoscopic reposition and fixation in the standing animal (Christiansen, 2004), and one-step laparoscopic fixation of the animal in dorsal recumbency (Newman *et al.* 2005).

2. RIGHT PARAMEDIAN ABOMASOPEXY

For paramedian abomasopexy, the cow is positioned in dorsal recumbency and surgery performed either under local or general anesthesia. Laparotomy is performed in the ventral paramedian area, delineated by the xyphoid process, the umbilicus, the right external abdominal vein and the midline (Lowe *et al.* 1965). The abomasum is decompressed and after returning to the correct position, it is fixed with non perforating seromuscular sutures to the abdominal wall. The abdominal incision is closed in routine manner. This technique allows for:

- repositioning of the abomasum with minimal manual effort,
- maximal exploration of the abdominal cavity, and
- passive discharge of pathologic uterine contents during dorsal recumbency.

Main disadvantages include the increased potential for torsions of the mesenterium and/or the gravid uterus and increased risk for incisional infection and/or dehiscence (Saint Jean *et al.* 1987).

3. RIGHT FLANK OMENTOPEXY

Laparotomy in the standing animal is performed in the right flank. The abdominal cavity is explored, the abomasum decompressed and manually returned to its normal position. The pyloric antrum of the abomasum is pulled to the ventral aspect of the abdominal incision and identified, and the omentum is sutured to the right flank at 10 cm caudal to the pylorus. Originally, Perlon-buttons have been used for secure fixation of the abomasum to the right body wall (Dirksen, 1967). Because of increased risk of abscess formation in the area of the subcutaneously positioned button, modified omentopexy was developed: the omentum was sutured to the body wall by two U-sutures and additionally by incorporation of the omentum into the ventral half of the most inner suture of the abdominal wall (Gabel & Heath, 1969). Alternatively, the greater omentum was attached to the right abdominal wall, using a silk ribbon (Zadnik *et al.* 2002). Advantages of the technique include high short-term cure rate of up to 98.5% (Bückner, 1995) and the fact that the intervention may be performed in the standing animal with minimal amount of technical personnel required. Manual correction of the abomasum to the anatomically correct position, however, demands advanced surgical skills and may be even more difficult in cases of advanced gestation.

4. LEFT FLANK ABOMASOPEXY

Laparotomy is performed in the standing animal in the left flank. The displaced abomasum is easily identified in the surgical field between the body wall and the rumen. A seromuscular Ford-interlocking suture -using non-absorbable material- is performed in the abomasal body, parallel to and at a distance of about 5 cm from the greater curvature (attachment of the greater omentum).

Both ends of the suture are kept long (Ames, 1968). Both sutures perforate the ventral abdominal wall at a distance of 5 to 10 cm from each other from inside and are tied outside the abdominal wall by an assistant. The area of fixation is delineated by the xyphoid process cranially, the umbilicus caudally, the right external abdominal vein and the midline. In our clinic, this technique is routinely performed in cases of advanced gestation.

5. TWO-STEP LAPAROSCOPIC ABOMASOPEXY

This technique was originally described by Janowitz in 1998 (Janowitz, 1998). It includes decompression of the abomasum and introduction of one toggle in to the abomasal body under laparoscopic control in the standing animal (step 1), followed by exteriorisation of the toggle suture through and fixation of the abomasum at the ventral abdominal wall with the cow in dorsal recumbency (step 2). Abomasal fistulas may occur as a complication of intraluminal suture and or toggle placement (Parker & Fubini, 1987).

6. ONE-STEP LAPAROSCOPIC ABOMASOPEXY IN THE STANDING COW

This technique was described in 2004 by Christiansen (Christiansen, 2004) and by Barisani (Barisani, 2004). The first part of the intervention is similar to step 1 of the Janowitz technique. Thereafter, the toggle-suture is guided to the site of perforation at the ventral aspect of the abdominal wall with a special instrument (Spieker according to Christiansen). Perforation of the abdominal wall and fixation of the abomasum is performed in the standing animal. As compared to the technique according to Janowitz, this technique carries the advantage that the complete procedure is performed in the standing animal.

7. ONE-STEP LAPAROSCOPIC ABOMASOPEXY IN DORSAL RECUMBENCY

This technique has recently been developed in North America. Surgery is performed with the cow in dorsal recumbency. Fixation of the abomasal body to the right paramedian ventral abdominal wall is achieved by placement of 4 seromuscular interrupted sutures, which are tied and knotted subcutaneously (Newman *et al.* 2005). As compared to both aforementioned techniques, it seems to be advantageous that the abomasal wall is not perforated, thereby minimizing the likelihood of abomasal fistula formation. The necessity for dorsal recumbency demands for additional technical personnel and may be qualified as a disadvantage of this technique.

8. CONCLUSIONS

As described above, many different techniques have been developed during the past decades for the correction of malposition followed by permanent fixation of LDA. The procedure elected will greatly depend on the surgeons preference, the economical situation, the general condition of the patient, and the available facilities. Given a cow in late gestation, the left flank abomasopexy represents the technique of choice as compared to all other mentioned techniques. The minimal invasive laparoscopic techniques may gain increased attention in the near future. As compared to the right flank omentopexy, the technique according to Janowitz has proven several advantages, including shorter surgery time and faster postoperative recovery, characterized by higher food intake and milk-yield and lower incidence of wound complications (Seeger, 2004).

9. SUMMARY

This presentation describes the normal anatomy of the abomasum, the incidence of LDA, and the risk factors for development of abomasal displacement in dairy cattle. The focus is set on treatment options of LDA. They include right paramedian abomasopexy, right flank omentopexy, left flank

abomasopexy, percutaneous toggle-pin fixation, two-step laparoscopic reposition and fixation, one-step laparoscopic reposition and fixation in the standing animal, and one-step laparoscopic fixation of the animal in dorsal recumbency. The laparoscopic techniques have gained popularity during the recent years and may represent the treatment options of choice in the future, because of economical and animal welfare reasons.

10. KEY WORDS

Left displacement of the abomasum, abomasopexy, omentopexy, laparoscopic techniques.

11. RESUME

Dans cet exposé, la position anatomique de la caillette, l'incidence d'un déplacement de la caillette à gauche ainsi que les facteurs de risque associés au développement du déplacement de la caillette dans un troupeau laitier sont présentés. L'accent est mis sur la description des différentes méthodes de traitement chirurgical d'un déplacement de la caillette à gauche. Ces méthodes sont les suivantes : l'abomasopexie ventrale, l'omentopexie à partir du flanc droit, l'abomasopexie à partir du flanc gauche, la fixation transcutanée par toggle-pin, la fixation laparoscopique en deux étapes, et la fixation laparoscopique en une étape sur la vache couchée. Les techniques laparoscopiques ont gagné en popularité ces dernières années et elles vont sûrement représenter un traitement de choix dans le futur aussi bien pour des raisons économiques que pour des raisons de bien-être animal.

12. MOTS CLES

Déplacement de la caillette à gauche, abomasopexie, omentopexie, techniques laparoscopiques.

13. ZUSAMMENFASSUNG

In diesem Referat werden die normale Lage des Labmagens in Abhängigkeit vom Gestationsstadium, Vorkommen und Inzidenz von linksseitiger Labmagenverlagerung (LDA), sowie Risikofaktoren für die Entstehung der Labmagenverlagerung vorgestellt. Das Schwergewicht des Vortrages liegt auf der Beschreibung und dem Vergleich der verschiedenen Methoden zur chirurgischen Behandlung der LDA. Diese beinhalten in chronologischer Reihenfolge ihrer ersten Erwähnung in der Literatur die ventrale Abomasopexie, die Omentopexie in der rechten Flanke, die Abomasopexie von der linken Flanke, die Toggle-pin Fixation, die laparoskopische Fixation in 2 Schritten, die laparoskopische Fixation in einem Schritt an der stehenden Kuh, und die laparoskopische Fixation in einem Schritt an der liegenden Kuh. Die Popularität der Reposition und Fixation des Labmagens unter laparoskopischer Kontrolle hat in den letzten Jahren sehr stark zugenommen. Es darf davon ausgegangen werden, dass die minimal invasiven Techniken diejenigen Techniken mit Laparotomie in Zukunft als Routineeingriff zur Behandlung der LDA ablösen werden. Als Vorteile der Laparoskopie werden sowohl ökonomische als auch tierschützerische Gründe aufgeführt.

14. SCHLÜSSELWÖRTER

Labmagenverlagerung, Abomasopexie, Omentopexie, Vorteile der Laparoskopie.

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