Neonatal distended abdomen

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Abstract

The case of the neonatal distended abdomen is often referred to as "bloat". Despite the common name, there are many different possible underlying etiologies for a distended abdomen in calves. This session discusses differential diagnoses, clinical reasoning, and diagnostic tools for investigation of common causes of bloat in calves.

Key words: bloat, calf

Résumé

La distension abdominale néonatale est communément appelée le ballonnement. En dépit de ce nom commun, l'étiologie peut révéler plusieurs causes sous-jacentes à la distension abdominale chez les veaux. Cette session va discuter du diagnostic différentiel, du raisonnement clinique et de outils de diagnostic pour l'analyse des causes fréquentes du ballonnement chez les veaux.

A distended abdomen, commonly referred to as 'bloat', is a relatively common problem in calves; however, it can sometimes be challenging to diagnose the underlying cause. Although the disease is commonly referred to as 'bloat', a true ruminal bloat is relatively uncommon in young calves due to minimal ruminal development, until after about 5 weeks of age.[8]

There are many possible underlying causes of abdominal distension in calves. To simplify the process of working up such a case, the basic causes can be broken down to the anatomic structures contained in the abdomen. Working roughly from oral to aboral, distension could result from the rumen, abomasum, intestines, free abdominal fluid, or rarely other organ or mass enlargement. Once the clinician has determined which basic structures are involved, they can start investigating problems likely to occur at that site. A non-exhaustive list of diagnoses by structure is provided in Table 1.

We have a number of tools at our disposal to sort out the source of abdominal distension. These tools commonly include the following: history and signalment, physical examination, passage of an orogastric or nasogastric tube, imaging such as ultrasound or radiographs, bloodwork, abdominocentesis, exploratory laparotomy, and necropsy.

The value of a thorough history should not be underestimated. Feeding history is of particular importance because many causes of abdominal distension are due to GI disease, with indigestion and associated ruminal or abomasal disease occurring frequently. Examples of causes of abdominal distension grouped by some very basic historical findings is provided in Table 2.

When bloat (or deaths due to bloat) are reported, a thorough history of feeding practices and milk/feed preparation processes is indicated. For example, when abomasal bloat has been diagnosed in a calf-rearing operation, particularly if it is a herd problem, it is advised to investigate many possible causes of abomasal dysmotility to identify control points that can be corrected. This history will likely include an investigation into colostrum quality control practices, possibility of feeding or mixing errors with milk replacer or addition of other components to milk preparation, water quality, bucket vs nipple feeding, nipple condition, feeding frequency, concurrent disease problems such as diarrhea or ulcers, and evidence or monitoring for nutritional deficiencies.

A thorough physical exam is arguably the most valuable diagnostic tool at your fingertips. Take note of perfusion (heart rate, capillary refill, extremity temperature, jugular fill, peripheral pulses); many of the causes of distended abdomen such as acute abomasal bloat or intestinal accidents are accompanied by severe systemic compromise and require IV fluid therapy. In pre-weaned calves, a lack of an appropriate suckle can indicate severe systemic compromise such as a concurrent acidosis or sepsis, or may be a clue that the animal is a rumen drinker. Examination of the abdomen may reveal left or right-sided abdominal distension, pings or splashes that can provide clues to the location of the problem, or presence of a hernia that may contain entrapped bowel. Generally, left-sided distension is indicative of ruminal disease, although left displaced abomasum can rarely occur in calves, and right-sided distension suggests abomasal disease, although the distended abomasum in young calves may result in roughly symmetric-appearing abdominal distension. Ruminal distension may result in ventral right-sided distension in addition to the left-sided distension with marked feed or fluid accumulation. Examples of causes of symmetric abdominal distension include intestinal accidents and obstructions, and conditions that result in free fluid in the abdomen (ex: uroabdomen, peritonitis). Examination of the thorax may reveal concurrent pneumonia, which would increase the suspicion of ruminal disease such as vagal indigestion. Examination of fecal output can provide clues ranging from lack of an anus in atresia ani, to decreased or absent fecal output consistent with an obstruction, to poorly digested feed in feces indicative of inappropriate rumen digestion in older calves. Palpation of the ventrum and extremities may reveal edema, which might increase clinician suspicion for causes of ascites and associated abdominal distension. The clinical

Table 1. Possible causes of a distended abdomen in calves broken down by anatomic site.

Anatomic site	Diagnoses
Rumen	Rumen drinking
	Grain overload
	Rumen impaction or obstruction
	Vagal indigestion
Abomasum	Clostridial abomasitis
	Indigestion/other bacterial overgrowth
	Abomasal impaction/obstruction
	Ulcers
	Displaced abomasum (rare in calves)
Intestines	Obstruction Intestinal accident (Ex: intussusception, mesenteric torsion, intestinal entrapment in a mesenteric rent/hernia/umbilical remnant) Foreign body Atresia
	Ileus Secondary to systemic disease (Ex: sepsis) Secondary to enteritis/ enterocolitis Peritonitis
Free fluid	Blood (hemoabdomen)
	Pus (peritonitis)
	Water (ascites, uroabdomen)
Other organ enlargement/mass	Uncommon in calves

Table 2. Examples of causes of abdominal distension in calves broken down by history and signalment.

Historical factor	Animal group	Diagnoses
Age	Neonate	Atresia ani/coli (other intestinal segments less common)
	Pre-weaned calves	Acute abomasal bloat
	Weaned calves with a history of pneumonia	Chronic, ruminal bloat
	Anytime	Intestinal accidents Free fluid ('blood, pus, water')
Feeding history	Bucket or bottle feeding	Abomasal bloat Ruminal drinking
Clinical progression	Chronic	Ruminal causes

picture for some common causes of abdominal distension using the history and PE are described in Table 3.

When the diagnosis is not obvious, or to prognosticate or plan treatment, further diagnostics may be warranted.

Passage of an orogastric tube is an inexpensive, relatively non-invasive intervention and can be helpful to confirm suspicion of proximal GI disease based on abnormal smell, volume or appearance of rumen contents. Lavage of abnormal rumen contents at the time of tube passage, when possible, can be beneficial in cases of ruminal drinking and grain overload or when abomasal reflux into the rumen is suspected in neonates.

Ultrasound has gained increasing utility as a diagnostic tool for investigation of abdominal conditions of cattle in both field and hospital settings. Some useful reviews of abdominal ultrasound in calves and in surgical decision making are referenced below.[2,3] Even under less than ideal imaging conditions, a basic differentiation can usually be made between causes of abdominal distension in calves using ultrasound. Ultrasound can easily be used to identify free fluid, and occasionally make preliminary determinations between hemorrhage (cellular, swirling), fibrinous peritonitis (strands/pockets of fibrin), and anechoic fluid representing possible ascites or uroabdomen. Distended loops of bowel in the case of an obstructive lesion are usually not challenging to identify in the right caudal region. Lack of bowel motility can be visualized in cases of ileus. A ruminal drinker can be confirmed by imaging the rumen and visualizing milk entering the rumen while feeding the calf.[4] A complete abdominal ultrasound using an abdominal probe, standard techniques, and appropriate restraint and lighting is ideal; however, even a field scan using the rectal probe trans-abdominally can provide useful basic information to differentiate basic causes of abdominal distension in calves as listed above. Quick and easy actions

Table 3. Common clinical pictures associated with causes of bloat in calves.

Common cause of 'bloat'	Common clinical picture
Abomasal bloat	Milk fed
	Acute colic
	Abnormal perfusion parameters
	Abdominal distension – R side prominent or bilateral
	May be found dead
Ruminal drinker	Milk fed, maybe bucket fed
	Poor suckle
	Poor BCS
	Abdominal distension- more obvious on L, to symmetrically pendulous
Ruminal bloat	Weaned calf
	Chronic poor doer- thin BCS
	Concurrent pneumonia
	Abdominal distension- L side prominent
Intestinal accident	Any age
	Severe, acute disease
	May follow other disease: enteritis, hernia etc.
	Signs of poor perfusion

to increase the quality of the image in field setting include clipping of the hair, application of plenty of coupling agent (alcohol or gel), and shade from direct sunlight on the screen.

Abdominocentesis and fluid analysis can be a useful tool in working up the acute abdomen, or in cases with abdominal effusion. Reference ranges for calf abdominal fluid have been published.[1] A specific diagnosis may be reached when abdominocentesis reveals specific obvious changes. For example, in septic peritonitis fluid is cloudy and may be foul smelling. In cases of uroabdomen, urine is retrieved from abdominocentesis; the presence of urine can be confirmed by using a BUN reagent strip, or by heating up the sample and assessing for the smell of urine. If abdominal fluid is hemorrhagic and has a high lactate, these changes indicate possible serious bowel compromise; if systemic signs suggest an obstruction or intestinal accident is possible, surgery is likely indicated rapidly. Changes in cell count, protein concentration, and lactate can be used to investigate inflammation, infection, and gut perfusion.

When available, blood work can be useful for working up cases of distended abdomen in calves. Even a simple electrolyte panel can be useful in initial diagnosis or emergency treatment plan. Increases in lactate suggest poor perfusion or serious compromise of cellular metabolism. Decreased chloride with concurrent signs of forestomach or intestinal disease may indicate a proximal GI obstruction. Marked hyperglycemia, beyond that expected for a stress response, may occur with clostridial enteritis. The results of a simple electrolyte panel can aid not only in diagnosing the cause of the distended abdomen, but can also be helpful for planning emergency fluid therapy as needed with acidosis, electrolyte imbalances, or cases with associated poor perfusion or shock. More extensive bloodwork, including a CBC and chemistry, can be more useful in working up cases with ambiguous underlying disease or to investigate comorbidities.

An exploratory laparotomy can be a very valuable diagnostic and potentially therapeutic tool when indicated. An exploratory laparotomy is indicated when obstructions or intestinal accidents are suspected, or when a diagnosis cannot be made using less invasive diagnostic tools and the animal fails to improve. The approach to laparotomy will depend on the ranking of differential diagnoses. If a rumen impaction or ruminal foreign body is suspected, a left-sided laparotomy and rumenotomy or rumenostomy are appropriate. If intestinal or abomasal surgical conditions are suspected, a right-sided or ventral midline approach are desired and surgeon preference will dictate between ventral midline and right-sided approaches. If a ruptured bladder or problem necessitating resection of umbilical structures is suspected, a ventral midline approach is indicated. A useful reference for surgical decision making in cattle is provided below.[5]

Of course, we can't forget about the value of a necropsy. It may be too late for the calf under your necropsy knife, but what you learn from necropsied animals you may use to prevent disease in others. Necropsy of freshly deceased animals is always preferable; this is *particularly* true when investigating abdominal distension cases, because GI lesions may be difficult to interpret after autolysis and other post mortem changes advance. Pay attention to gross findings as well as sample collection for ancillary testing such as histology or specific pathogen testing. A nice reference for necropsy findings of the GI tract is listed below.[6] Consider saving liver and kidney for trace mineral, vitamin E, and selenium testing. This monitoring is useful for herd monitoring in general (don't waste a dead), and may also be important for working up a variety of herd problems that may present with signs referable to the GI tract.[7,8]

Conclusions

There are many potential causes of abdominal distension in calves. Some causes are extremely common, such as abomasal and ruminal 'bloat'. When these disease are diagnosed, it usually warrants clinician investigation into herd management to help producers identify control points for these diseases and make recommendations for changes or improvements to *specific* aspects of feeding or health management. Close investigation of feeding practices can reveal useful information relating to bloat in calves. Observation of milk preparation, feeding, and bottle hygiene can all reveal clues that may identify control points for indigestion that have been missed. Anything that affects abomasal motility has the potential to result in abomasal bloat. As the rumen develops, a closer investigation into the solid ration is imperative for investigation of ruminal bloats. If ruminal bloats are associated with respiratory disease, practices for minimizing respiratory disease should be re-evaluated. For more detail on specific conditions, the reader is referred to the excellent references.

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