# The Diagnosis of the Surgical Disorders of the Bovine Abdomen

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**Summary**

This paper is concerned with the classification of the surgical disorders of the bovine abdomen into logical groups from the point of view of diagnosis and differential diagnosis, using traumatic reticulo-peritonitis as a diagnostic baseline.

## Introduction

The 1950's were important years as regards an understanding of the surgical diseases of the bovine abdomen. Previously the cattle clinician had been reasonably familiar with traumatic reticulo-peritonitis, but tended to group all other abdominal conditions together under the broad heading of "indigestion." Little attempt was made to differentiate the diseases which constitute this heading. Improvement in our knowledge of abdominal disease was associated with improvement in surgical techniques, the use of antibiotic cover, and the appearance of a generation of clinicians willing and able to utilise exploratory laparotomy as a diagnostic technique. The thriving condition of agricultural economics during most of this decade provided the impetus for a great deal of work on the bovine abdomen.

The 1960's, for the most part, were years of consolidation and classification of the information already gained, and a great deal of work on the pathogenesis and etiology of abdominal disease was carried out.

In this connection especial mention should perhaps be made of a thesis on the etiology and pathogenesis of abomasal displacement by Svendsen (1969). Among a number of papers of importance to the diagnostician were those by Neal & Edwards (1968) on vagus indigestion and by Espersen (1964) on dilatation and displacement of the abomasum to the right, and dilatation and torsion of the caecum. Pearson's contribution to the discussion on this paper was a valuable publication in its own right.

During the last years of this period the development of "low cost-low production" farming, resulting in cattle producing less milk from less food, produced a decline in the incidence and the importance of the surgical abdominal conditions, particularly those of the abomasum. The decline in agricultural prosperity, and the development of an unfortunate mental attitude professing disinterest in the individual animal, contributed to the fall in incidence, at least of the cases presented to the clinician. The writer had begun to regard the study of the bovine abdomen as a matter of history when the recent phenomenal rise in the value of cattle emphasised once again the importance of these surgical conditions of the bovine animal.

## The Diagnosis and Differential Diagnosis of Traumatic Reticulo-peritonitis

It still seems logical to the writer to begin any diagnostic study of the bovine abdomen by considering traumatic reticulitis. The possibility of overlooking a penetrating foreign body, a serious mistake for both patient and clinician, is always at the back of one's mind when examining a bovine abdomen. It is always a considerable relief if one can eliminate the possibility of a foreign body and its complications, and such a process is, of course, very important to the surgeon when considering the site of a possible exploratory laparotomy. Nevertheless, neither the confirmation nor the refutation of a provisional diagnosis of traumatic reticulitis is easy without exploratory laparotomy, for the clinical syndrome presents such wide variations as regards both extent and intensity of symptoms that it is probably true to say that the only constant clinical sign is the presence of some degree of pain in the anterior abdomen. The range of differential diagnosis is therefore wide, and includes several groups of clinical conditions each capable of confusion by virtue of exhibiting one or more of the symptoms associated with reticulitis.

The acute clinical syndrome not infrequently encountered at the onset of the condition includes complete inappetence, and ruminal and reticular atony, resulting in ruminal impaction and slight tympany, with absence of ruminal movement and cudding. Constipation may also be a feature. Temperature may be 104-105°F, with a pulse rate of 80-90 per minute. There is a marked drop in milk yield. The painful focus in the anterior abdomen results in general rigidity with arched back and protruding neck, disinclination to lie down, and spontaneous grunting accentuated by movement, defaecation, and micturition, and very marked on pinching the withers or applying upward pressure to the xiphisternal region.

This acute syndrome is by no means constant even at the onset of reticulitis, and when present usually abates in 24-36 hours as the intensity of pain lessens, and varying degrees of ruminal and reticular motility return. Temperature tends to fall into the 102-103°F range; pulse rate may be in normal range or slightly raised, appetite, although poor, is not completely absent, ruminal impaction and tympany largely disappear, and faeces regain normal consistency. The painful rigid stance relaxes and although the back remains somewhat stiff and arched, pain may require elicitation by the clinician rather than being obviously spontaneous. Rumination, however, nearly always remains absent, or irregular and occasional.

In some cases the only clinical signs are slightly depressed appetite and rumination, subnormal milk yield, and indications of pain so slight that they amount to no more than unwillingness to depress the back, so that even mild and painless diseases such as acetonaemia have to be considered in differential diagnosis.

### Ancillary Aids to the Diagnosis of Traumatic Reticulitis

The blood white cell picture has been widely used in the diagnosis of reticulitis but in the writer's view its value lies in the elimination of a diagnosis of reticulitis rather than in its confirmation. An animal showing a total and differential white cell picture wholly within the normal range is most unlikely to be affected by traumatic reticulitis, and the writer is unwilling to accept such a diagnosis in cases where the total count is below 10,000 per cu. mm and the total neutrophil percentage is below 50.

On the other hand, white cell figures in excess of those stipulated may occur in many conditions involving septic foci, and may also be encountered at parturition, at other periods of metabolic stress, and may even occur in the apparently normal cow. It is true that a marked shift to the left suggests the presence of an acute, pyogenic focus, particularly in blood pictures with total white cell counts exceeding 15,000 per cu. mm and neutrophil percentages exceeding 60-65, but only a careful study of the clinical picture can justify the conclusion that a penetrating foreign body is the primary cause. It will be observed that a number of the conditions to be discussed in differential diagnosis produce white cell pictures similar to that of reticulitis.

The writer believes the electronic metal detector to be of little or no value as a diagnostic aid and is pleased that its use has now ceased to be fashionable. Its effective range is so short that an absence of reaction is no indication that a foreign body is not present, whilst a positive reaction merely indicates that a piece of ferrous metal is present in the reticulum, but gives no indication whatsoever that this metal either is, or has been, penetrating the reticular wall, and is the cause of the illness under consideration.

Exploratory laparotomy and, where necessary, rumenotomy, is an extremely valuable diagnostic aid, and undoubtedly should be regarded as such, just as much as a method of treatment.

The special diagnostic procedure developed by Williams (1955) and now generally known as "the Williams test" for traumatic reticulitis, is of very great value, but it nevertheless has its limitations. Depending as it does upon the presence of a recognisable ruminal cycle in the patient, it is inapplicable in the acute early cases where complete rumen atony is still present, and may be difficult to apply in the somewhat less acute cases where rumen movement is irregular and variable. It may, of course, be said that such acute cases are more easily diagnosed on clinical evidence alone, than the much milder cases where a definite reticulo-ruminal cycle is present, and where the test is not only applicable, but very useful in the absence of a spectacular clinical picture.

**The objection has also been made that the test requires quiet surroundings, patience, and careful observation if positive cases are not to be missed. With respect the writer suggests that, however unfortunate the conditions of the modern general practice, the clinician who considers time more important than patient clinical observation is unlikely to become skilled in the diagnosis of any abdominal disease.**

The writer has sufficient faith in the method to operate without hesitation in every "positive" case, but does not consider that a negative Williams test precludes the possibility of traumatic reticulitis.

The acute and subacute syndromes described above are, of course, essentially those of localised peritonitis, and pictures similar in broad outline will result from *other causes of localised peritonitis*, although the veterinarian may be able to differentiate the focus of pain.

(1) *Penetration of the involuted uterus or the vaginal fornix* by a catheter or damage to the anterior vagina at service may produce a picture similar save for considerably less interference with alimentary motility, and for pain response on pressure over the posterior abdomen or on rectal examination. Such injuries frequently evoke straining, indicating the need for vaginal examination.

(2) *Post-operative peritonitis* may well provide a syndrome similar to that of moderately acute traumatic reticulitis, but the fact of recent operation and the possibility of peritonitis resulting therefrom will be obvious to the clinician particularly after procedures such as trocharisation for the relief of bloat.

(3) *Perforation of an abomasal ulcer* may present a picture broadly similar to that of acute traumatic reticulitis if seen in the early stages before diffuse peritonitis, collapse and death occur. There is likely, however, to be acute pain over a much wider area of the anterior abdomen, particularly on the right side, than is the case in reticulitis. Any temperature rise is likely to be transient only, but the pulse rate will be

considerably in excess of that expected in reticulitis and may exceed 100 per minute. There will be grinding of the teeth and loud groaning as well as grunting of a similar type to that seen in acute reticulitis. The cow will not eat, is greatly depressed, and remains largely recumbent. In a proportion of cases, though by no means all, the abdomen becomes distended with gas, presumably by leakage through the perforation, and a state of true peritoneal tympany develops.

(4) A peritonitis syndrome varying from a very acute picture associated with shock to a subacute picture sometimes associated with straining is occasionally met with as the result of *penetration of the rectum* by a foreign body, usually a broom or pitchfork handle, introduced through the anus by an attendant with sadistic tendencies. Such a lesion is always detectable by rectal examination.

(5) The more acute lesions of *tubercular peritonitis*, as seen in the breakdown forms of the disease occasionally produce an abdominal syndrome so similar to that of traumatic reticulitis that unless there are obvious coincidental signs of tuberculosis, diagnosis is made only on opening the abdomen with the intention of performing rumenotomy when the blood-streaked, caseating, and even exudative lesions of the acute disease may be only too obvious. This syndrome is now, of course, very rare; but it is just as well to remind ourselves of its occurrence for today's graduate may well have no knowledge of the possibility, and tuberculosis is still a disease which one would prefer to diagnose accurately.

Having considered the differentiation of traumatic reticulitis from other causes of peritonitis, one must now be prepared to differentiate moderately severe forms of the disease from *conditions which, although not involving peritonitis, cause pain in the anterior abdomen or posterior thorax*. This question of pain in the anterior abdomen or posterior thorax is, of course, very important in the diagnosis of reticulitis, for one must remember that the reticulum, diaphragm, liver, abomasum, omasum, heart, pleurae, oesophagus, and the posterior lung areas all lie approximately along the vertical line between the point at which one pinches the withers and the point at which one applies the bar.

(1) *Bacterial endocarditis* described and reviewed by Rees Evans (1957) obviously requires differentiation from other cardiac diseases, but it is not generally realised that in its earlier stages, before signs of venous congestion and circulatory stasis supervene, endocarditis is readily diagnosed as traumatic reticulitis. Pain, often intermittent in nature, and causing rigidity of stance with abduction of the left, or both elbows, and discomfort when pressure is applied to the withers, xiphisternum, and left ventral aspect of the chest, is probably due to infarction of the lungs or myocardium, but is not unlike that due to a foreign body penetrating the reticulum. Once venous congestion is clinically obvious the fact that the heart is diseased becomes apparent, and from this point the clinician must eliminate other cardiac diseases, particularly traumatic pericarditis, an exercise beyond the scope of this paper. Previous to the development of venous congestion, accelerated respirations with dyspnoea and coughing on exercise, the peculiar "shifting" lameness of endocarditis, the tendency towards a markedly high pulse rate even when temperature is responding to antibiotics, and the presence in some cases of recognisable abnormality of heart sounds, may all help in differentiating endocarditis from reticulitis. The writer is cautious on the subject of heart sounds, for although he has frequently been assured by skilled cardiologists that a murmur will always be audible in this disease, he has frequently failed to detect a murmur in cases with a right-sided lesion. It is noticeable that endocarditis cases tend to retain a relatively bright demeanour, and reasonable appetite until the late stages of the disease. The white cell picture is of limited value as many cases present total and differential counts similar to those produced by a penetrating foreign body, although there is a tendency for both total white cell count and neutrophil percentage to be higher than in that disease.

(2) Certain cases of *pneumonia* and *pleurisy*, particularly the latter, exhibit symptoms of posterior thoracic pain which may simulate reticulitis, and careful auscultation of the chest is necessary in an attempt to confirm the presence of abnormal thoracic sounds.

(3) *Impaction of the abomasum* involving primarily the pyloric outlet, with large quantities of fibrous foodstuffs, sand or gravel may occur very occasionally. There is a slow diminution in appetite and milk yield, and progressive ruminal impaction comprising solid food material with, occasionally, a little gas. Rumination ceases and constipation occurs. Temperature is never more than slightly raised, but pulse rate may eventually exceed 100 per minute. At first there is slight anterior abdominal pain only, but as the disease progresses, pinching of the withers and pressure over the xyphisternum are presented markedly. Pain may, in contradistinction to the case in reticulitis, be evoked by pressure over the anterior part of the right flank. The white cell picture may be in normal range or similar to that of "wire." Although the patient becomes much weaker and more depressed than is the case in reticulitis it is doubtful whether differentiation will be made before exploratory laparotomy reveals the distended doughy abomasum.

The writer believes that true abomasal impaction is very rare; and that most of the cases described as abomasal impaction in the past have shown distention of the fundic portion of the abomasum with material like dry rumen contents, and an accumulation of fluid within the rumen, which suggest very strongly that they are in fact cases of "vagus indigestion."

(4) *Painful conditions of the liver* obviously present a problem in differentiation within the group of diseases causing pain in the anterior abdomen or posterior thorax. The liver is a very difficult organ

from the clinician's viewpoint. It is anatomically inaccessible, and in spite of the considerable volume of work carried out in recent years there are still no really satisfactory tests of liver function in the bovine species.

The cow has large reserves of liver tissue, and very considerable damage may occur without the production of a clearcut syndrome. Liver biopsy is of limited value in that the portion of liver obtained may be quite unrepresentative of the whole, and the writer prefers to make an incision behind the last rib, in the right sublumbar fossa, sufficiently large to allow manual examination of the liver, and even, using a small torch, limited visual examination. A biopsy specimen can, if required, be obtained through such an incision with the minimum of risk.

In those areas where liver-fluke infestation presents a problem in cattle, inflammatory changes and even abscessation in the liver, associated with the presence of liver-fluke, may produce a clinical syndrome very similar to that of traumatic reticulitis, and quite distinct from the chronic wasting and anaemia usually associated with these parasites. There is frequently a mild febrile reaction and inappetence, with pain in the anterior abdomen producing response to pressure over the withers and over the anterior part of the right flank. Ruminal motility is less affected than in cases of reticulitis, and the blood picture may be in the normal range. A knowledge of a liver-fluke problem on the farm may be of assistance, as may the presence of liver-fluke eggs in the faeces, but such evidence is far from convincing as there is no reason why a fluke infested animal should not suffer from any other abdominal disorder.

*Abscess formation in the liver* unassociated with parasitism not infrequently occurs, and may produce a clinical syndrome with malaise, unthriftiness and mild anterior abdominal pain, but such a diagnosis must be approached with considerable caution as it is possible for extensive abscessation of this organ to be observed in abattoir specimens in which the animal was apparently in perfectly normal health.

The presence of *a biliary calculus* in a cow has been described (Ford, 1955). This case was a recently calved cow with a poor appetite and lower milk yield. Temperature was 102°F, and respirations were slightly accelerated. Rumen movement was absent, faeces were soft and the gait was stilted and swaying. The nasal and oral mucous membranes were at first faintly, and later markedly, jaundiced. The development of pain on pressure over the withers and beneath the sternum led to the performance of an operation for traumatic reticulitis, with negative results. Ketosis and diarrhoea developed. On postmortem examination the calculus was found in the common bile duct just beyond the junction of the hepatic and cystic ducts. It should be noted that jaundice is a comparatively rare finding in liver disease in the cow, and is equally likely to indicate a haemolytic condition.

(5) *Pyelonephritis* in its more severe forms produces pain which, although not sited in the anterior abdomen, can easily lead to confusion with traumatic reticulitis. It may be said that, in spite of the raised temperature and pulse rate, the arched back, and the grunt not infrequently present, urine examination leaves the diagnosis beyond doubt. Nevertheless, the attendant has frequently failed to observe the urine, and unless the veterinary surgeon adheres to a systematic clinical routine the fact of its abnormality may escape him also. The white cell picture in pyelonephritis is generally similar to that of "wire."

**Cases of acute traumatic reticulitis with ruminal impaction require differentiation from other conditions presenting this feature.**

(1) Impaction of the abomasum has already been discussed.

(2) Dietetic ruminal impaction is a condition usually encountered in store cattle wintered in yards, fed on straw and poor quality hay, and with limited access to water. The ruminal distention in these cases is generally very obvious, and palpation in the left sublumbar area produces a dense doughy sensation. Ruminal movement is absent, and faeces are infrequent and very hard. Temperature and pulse may be markedly raised, and the condition is also characterised by arching of the back, rigidity of stance, and a loud and very frequent moaning grunt which, like the ruminal distention and the solidity of the rumen content, is much more marked than in traumatic reticulitis. The blood picture is generally in the normal range. The ruminal distention tends to remain practically unchanged over several days, whereas the impaction seen in reticulitis cases generally disappears to a considerable extent in 24-36 hours. Grunting in these impaction cases may be provoked by pressure over a large area of both flanks, rather than on pressure over withers and beneath xiphisternum alone.

**A similar condition, although much less marked, may occur in dairy cows, tied in barns during the winter, should the waterbowl cease to function, a mishap which frequently escapes the attendant's notice, and is always worth checking. Modern systems of building and management have markedly decreased the incidence of these two conditions, although it should perhaps be suggested that these conditions were considerably less harmful than several of the diseases to which these same modern systems have predisposed.**

(3) *Impaction of the rumen with grain* occurs in cows which have broken into a food store and eaten greedily, but even when the attendant is unaware of this, or will not admit it, the nature of the case generally becomes apparent in 2-3 days time when profuse diarrhoea, staggering, recumbency, subnormal temperature, rapid pulse rate, and other evidence of toxic effects occurs in severe cases. In cases seen soon after ingestion of large quantities of

grain palpation of the left sublumbar fossa may produce the same sensation as does handling a sack of grain. If, as is generally the case today, the grain is, in fact, barley, the interim period of impaction, with arched back, grunt, depression and moderate tympany is likely to be transient, and within a few hours the profuse diarrhoea so characteristic of barley poisoning appears. Nevertheless the writer has on more than one occasion been on the point of embarking upon rumenotomy when the appearance of diarrhoea has saved him from error.

*Conditions producing acute ruminal tympany* are unlikely to present difficulties in diagnosis. The seasonal incidence, dietary circumstances and the very acute nature of the tympany in bloat leave little room for diagnostic doubt, whilst the only other condition likely to produce acute ruminal tympany is complete oesophageal obstruction by a potato or portion of root. The nature of the diet, and the discomfort, salivation and characteristic posture of the head and neck seen when the obstruction is in the upper oesophagus, usually render diagnosis easy, although impaction of a foreign body in the thoracic oesophagus sometimes necessitates the passage of stomach-tube or probang, and even rumenotomy, before diagnosis is certain.

*Subacute and mild ruminal tympany* is seen in several conditions requiring differential diagnosis from traumatic reticulitis. The tympany which occurs in early cases of traumatic reticulitis is never marked, is superimposed upon ruminal impaction, and disappears in 24-36 hours. Mild or intermittent subacute tympany is seen in actinobacillosis of the rumen and reticulum. Diagnosis of this disease is often difficult, but the differential features include an insidious onset and slow development, loss of condition, freedom from pain, a normal temperature and pulse rate, and in some cases evacuation of small amounts of rumen content through the mouth. Demeanour is usually bright, and as Begg (1950) pointed out, regurgitation may become a noisy and laboured procedure, particularly at the beginning of a period of rumination. Exploratory rumenotomy will confirm diagnosis by revealing the smooth thickened areas in the ruminal or reticular walls with, in the latter, disappearance of the honeycomb structure. Biopsy of the affected tissue may be performed at operation.

Both *actinobacillosis* and *tuberculosis* may occasionally cause enlargement of the posterior mediastinal lymph nodes causing partial oesophageal obstruction and chronic mild ruminal tympany. Unless lesions of the disease concerned are apparent elsewhere definite diagnosis can be difficult, though the site of obstruction can often be determined by careful passage of a stomach tube.

Intermittent mild or subacute ruminal tympany may also occur due to oesophageal lesions. Traumatic stricture, abscess formation in the wall, the presence of fibropapillomata or the impaction of food material in an oesophageal dilatation may be concerned. These conditions usually cause difficulty in ruminating, or even inability to do so, while in severe obstructions collection of food in the oesophagus and regurgitation into and out of the mouth may occur. Passage of a stomach tube will again assist diagnosis, though the exact nature of the lesion often remains obscure.

Subacute tympany is also frequently seen in tetanus which is, however, discussed more conveniently under another heading.

### Differentiation is occasionally required between traumatic reticulitis and other conditions causing stiffness and rigidity of stance.

Tetanus, for example, is not infrequently diagnosed as traumatic reticulitis in the first instance. Not only does a moderate tympany occur in the bovine tetanus case, but the arched back and stiff unbending stance may be quite confusing, and constipation is also a usual feature. Points of differentiation include the normal temperature and blood picture in tetanus, trismus, and the partial elevation of the tail, but the bovine case does not usually show the protrusion of the membrane nicititatings, the erection of the ears, nor the hyperaesthesia found in the horse, whilst sguggish stilted movement is generally possible.

It is probably worth mention that a cow with longstanding under-running lesions of both hind feet may at first glance resemble a case of "wire" but careful abdominal examination will eliminate the possibility. Laminitis may produce similar confusion.

On several occasions injury to the lower cervical vertebrae resulting in pain, stiffness, and reluctance to bend the lower part of the neck, have led to an erroneous diagnosis of reticulitis. One can only suggest that careful clinical examination should differentiate these conditions, but such cervical injuries are infrequent and not always in the clinician's thoughts.

## The Diagnosis of Complications and Sequelae Associated with Traumatic Reticulitis

The differential diagnosis of traumatic reticulitis and other diseases of the anterior abdomen is complicated by a number of circumstances.

(1) Cases are encountered where a piece of wire loose in the reticulum, by reason of its shape, repeatedly pricks the reticular wall and is then dislodged, producing minor episodes of pain and localised peritonitis which rapidly resolve. By the time operation has been decided upon the animal is substantially normal and surgery is withheld, only for the syndrome to be repeated after varying intervals of time. It is possible that such "pricks" should be included with transient phases of abomasal displacement as the reason for most of the "non-specific inappetence" so well known to every bovine clinician.

(2) A difficult problem is the case where traumatic reticulitis is strongly suspected and rumenotomy

carried out, only to find that in spite of the presence of definite reticular adhesions, no foreign body can be found. There are three possibilities. Firstly, the adhesions may be longstanding and bear no relation to the present illness, i.e. the diagnosis is incorrect. This possibility can be checked by applying digital pressure to the adhesions–if pain is provoked they are probably pertinent to the present ill health. Secondly, the foreign body may have become dislodged and passed down the gut, or even regurgitated, in which case prognosis is good. Thirdly, the foreign body may have passed completely through the reticular wall and be buried in adhesions and reactionary tissue beyond. Here the prognosis is obviously grave.

One can only advise a wait-and-see policy, but such cases do present difficulties in the management of clients who expect the production of a foreign body and, in its absence, are frequently inclined to doubt the diagnosis and regard the operation as an error on the part of the clinician.

(3) An occasional but nevertheless difficult case is the cow from whose reticulum a foreign body has previously been removed and which now, weeks or months later, is showing a clinical syndrome suggestive of "wire." Has there in fact been a penetration by a further foreign body; or are the symptoms due to a flare-up of infection or abscess formation in the old adhesions? Is further operation indicated or not? In cases which do not respond promptly to antibiotic therapy it is always wise to reoperate; even if no further foreign body is involved an abscess may be found which can be drained into the reticulum.

(4) A further group of conditions occur where a foreign body penetrating the reticulum has since penetrated a further organ. Symptoms in these cases are usually related largely to this secondary occurrence and the signs, all-important prognostically, of the primary foreign body etiology tend to be masked. The classical example of this type of condition is traumatic pericarditis, producing a syndrome very well recognised, but presenting considerable difficulty at times in differentiation from endocarditis.

Penetration of the thoracic cavity to produce suppurative pneumonia or pleurisy also occurs, tending to produce a subacute thoracic syndrome with progressive loss of condition. It is of considerable importance prognostically to know whether such a condition is due to a penetrating foreign body or not and it is often extremely difficult in the presence of pain in the posterior thorax to decide whether pain exists in the anterior abdomen as well. The white cell picture will not help; and exploratory laparotomy may be necessary as a diagnostic aid.

Similarly, foreign body penetration of the liver may occur, causing a large area of suppuration which may produce a clinical picture similar to the acute liver-fluke syndrome previously mentioned, but with reticulo-ruminal interference as well. Extensive liver lesions of this type occasionally interfere sufficiently with the bile ducts to cause jaundice.

(5) It will be realised that until now discussion has centered basically about the differential diagnosis of localised peritonitis, the most common cause being traumatic reticulitis. It is fortunate for the veterinarian that the bovine peritoneum is highly efficient at confirming and localising inflammatory changes. Occasionally, however, this mechanism breaks down, giving rise to acute diffuse peritonitis, with the accumulation in the abdomen of large quantities of evil-smelling thin milky pus, and fibrin. This is an occasional sequel to traumatic reticulitis which for some reason has been seen more often by the writer in bulls and young stock than in cows. It may be said in passing that the diagnosis of traumatic reticulitis in bulls is often difficult whether the syndrome is that of a localised or a diffuse peritonitis. The massive conformation, and low-grade reaction to pain may cause difficulties even if the demeanour makes proper examination possible. In acute diffuse peritonitis the original period of inappetence is followed by a period of malaise and impaired rumination, with progressive weakness and loss of condition. The eyes become sunken, and a scanty dark diarrhoea develops. Temperature may be in the normal range, or even subnormal, whilst pulse rate is fast and thready, and increases to 100+ per minute as toxaemia develops. In young stock parasitism may be suspected but the demonstration of anterior abdominal pain, and the presence of a fluid wave across a pendulous and sometimes distended abdomen are useful diagnostic signs. The white cell count indicates acute sepsis, whilst the presence of free pus in the abdomen is easily confirmed by paracentesis, simply carried out by passing a hypodermic needle through the abdominal floor at its lowest point, i.e., somewhere near the umbilicus, using normal restraint and cleanliness and taking care to avoid confusing the position by penetrating the rumen.

(6) A second and very important complication of traumatic reticulitis producing abdominal distention is *vagus indigestion* described so well by Neal & Edwards (1968) that is is unnecessary to consider the subject in great detail in this paper. From the diagnostic point of view it is important to remember that the condition is basically a functional stenosis of the reticulo-omasal orifice, with or without rumino-reticular atony, and sometimes associated with a functional pyloric stenosis and a type of abomasal impaction.

The majority of such cases are due, it is believed, to damage to the vagus nerve resulting from the adhesions of traumatic reticulitis, although many other factors, e.g., enlargement of the posterior mediastinal lymph nodes, lymphosarcoma, diaphragmatic hernia, or pleuritic adhesions, which interfere with the relevant branches of the vagus nerve may have the same effect. Leek (1968) suggested that damage to the tension receptors in the medial wall of the reticulum and the cranial sac of the dorsal rumen due to adhesions might interfere with function of the vagus nerve without cuasing actual

damage to it. It is interesting that the adhesions found at postmortem examination in cases of vagus indigestion almost invariably involve the right wall of the reticulum, but seldom involve the diaphragm. This fact may explain the absence of a previous painful episode in cases of vagus indigestion, for visceral peritoneum is relatively insensitive to pain.

Diagnosis is based upon the clinical picture, which includes an initial vague illness with inappetence and often some ruminal tympany leading to progressive loss of weight, while the rumen gradually becomes distended with fluid. Little or no faeces are passed, but water intake is at least normal. Temperature remains in normal range, whilst pulse rate progressively rises, and increasing pain with grunting and groaning develops as the abdomen distends. The cow becomes weaker and eventually recumbent. The white cell picture in most cases approximates to that of reticulitis. The nature of the ruminal distention is important diagnostically, for when viewed from behind, the greatest distention is seen high on the left flank and low on the right producing the so-called "ten to four" picture. Some cases show excessive ruminal movement with contents of a homogenous porridge-like consistency, and minimal rumen sounds, while others show a complete absence of movement associated with a thin yellowish fluid content containing lumps of undigested food. This type of case produces sounds on left flank ballottement similar to, but louder and covering a wider area than the sounds heard in abomasal displacement to the left. Rectal examination aids diagnosis except in heavily pregnant animals, but exploratory laparotomy and rumenotomy will confirm the diagnosis satisfactorily except in occasional cases of co-existent left abomasal displacement or right sided abomasal dilatation or torsion. In spite of the fatal nature of the condition it is probably worthwhile carrying out exploratory laparotomy on every suspected case as a practically identical syndrome may occur following mechanical as opposed to functional reticulo-omasal obstruction, and recoveries have occurred following the removal of foetal membranes impacted in this orifice, or the excision of papillomata from this site.

These two syndromes, acute diffuse peritonitis, and "vagus indigestion," both arising as complications of traumatic reticulitis, *require differentiation from other conditions producing abdominal distention due to causes other than ruminal impaction or tympany.*

(1) hydrops amnion or allantois

(2) extra uterine foetus due to rupture of the uterus

(3) dilatation or torsion of the abomasum on the right

(4) occasional acute cases of abomasal displacement to the left

(5) ascites due to obstruction of the portal circulation

(6) occasional cases of acute tympanitic intestinal colic

(7) torsion of the caecum, colon and small intestine on the common mesentery

(8) occasional cases of peritoneal tympany following perforation of an abomasal ulcer

*Hydrops* should present little diagnostic difficulty within this group, the history of the case and careful rectal examination sufficing; nevertheless cases both of "vagus indigestion" and of abomasal torsion have been presented to the writer as cases of hydrops. At the same time it must be accepted that occasional obstetrical cases may present great difficulty in diagnosis, as for example, the case where rupture of the uterus has occurred in the late stages of pregnancy followed by the formation of fibrinous exudate in an abdomen filled with free uterine fluid and containing foetus and membranes. Such an abdomen presents fluid distention and a fluid wave which on rectal examination appear to be unassociated with the uterus, accompanied by abdominal pain, rapid pulse, and often, severe illness. Diagnosis depends upon an accurate history and the demonstration by ballottement of a foetus in the lower abdomen, whilst rectal examination reveals an empty, partially involuted uterus.

Dilatation or torsion of the abomasum are readily differentiated within this group of conditions by the unilateral nature of the distention and the typical abomasal sounds, and by the demonstration of the distended abomasum by rectal examination, but occasional acute cases of left-sided abomasal displacement may be difficult to differentiate from cases of "vagus indigestion" particularly as the acute form is more often seen in the pregnant animal and rectal examination is therefore less satisfactory. On the whole the sounds produced by left flank ballottement are likely to be louder and more extensive, but less resonant, in "vagus indigestion."

The occasional cases of portal obstruction seen may be difficult to differentiate from diffuse peritonitis. They are generally accompanied by gross venous congestion and swelling of the liver, and are due to constriction of the lumen of the vena cava or the hepatic veins due to abscess formation in the vessel walls and thrombus formation in their lumen. The liver may show cirrhosis, necrosis and multiple abscessation, sometimes, but not always, due to liver-fluke infestation. Such animals show pain in the anterior abdomen, inappetence, malaise, and a mild febrile reaction, whilst the enlarged liver may be available to palpation behind the last rib and even, in a small animal, to rectal examination. There will be a fluid wave across the abdomen (paracentesis produces a milky ascitic fluid) and exploratory incision behind the last rib on the right side will reveal the diseased liver.

The cases of acute tympanitic intestinal colic occasionally seen may be confusing at first, but usually subside fairly quickly developing a transient but profuse diarrhoea. Such cows are generally grazing rich pasture, do not appear particularly toxic, and re-

main relatively bright and alert. Loops of distended gut may frequently be felt on rectal examination, after protruding far back within the pelvic cavity, and the fairly transient symptoms of acute colic, kicking at the belly, getting up, lying down, and looking around at the abdomen, bear no resemblance to the other conditions listed except perhaps torsion of the caecum which will be considered later.

The peritoneal tympany occasionally associated with a perforated abomasal ulcer has already been discussed.

### The Omasum

For many years the writer believed that disease of the omasum was always secondary to disease conditions of the other stomachs, as for example in abomasal torsion where the omasum, as well as the abomasum, rotates in a vertical plane about a common transverse axis passing approximately through the omaso-abomasal orifice (Neal & Pinsent, 1960).

The omasum may also be involved in the impaction of "vagus indigestion" along with the abomasum. Recently, however, the writer has encountered two cases of chronic loss of weight, inappetence, low-grade abdominal pain, and malaise in cattle, in which at post-mortem examination the only lesions found after a thorough search were extensive areas of necrosis and ulceration of the omasal leaves. He is still uncertain of the etiology, and of the significance of these lesions.

### The Diaphragm

Diaphragmatic hernia occasionally occurs in cattle as described by Jones (1959), producing a variable clinical picture depending upon the size of the hernial opening, and the extent to which the stomachs or other abdominal organs are involved and obstructed. The most commonly prolapsed organ seems to be the reticulum, and the result is interference with the motility and function of the rumen and reticulum. It is not difficult to see that such a hernia, involving the reticulum, the reticulo-omasal orifice, and even occasionally the omasum itself, might easily lead to "vagus indigestion." Other abdominal organs are occasionally involved in this type of hernia. Although colicky pain may occur at the time of rupture, it is not a persistent feature and it is more usual to find a low-grade pain in the posterior thorax/anterior abdomen reminiscent of reticulitis. Such pain may be due not only to the formation of adhesions within the hernial ring (implying, of course, a localised peritonitis) but may also result from a co-existent traumatic reticulitis, a state of affairs apvarently not uncommon in cases of diaphragmatic hernia. Not only may symptoms of abdominal pain, subacute alimentary obstruction, and even vagus indigestion be noticed, but symptoms due to interference with cardiac and pulmonary function caused by diminished intrathoracic space may also be present. In severe cases some degree of respiratory difficulty may be observed together with signs of venous congestion. On the other hand, cases where only a small portion of reticulum has invaded the chest may show no thoracic symptoms. Whilst diagnosis may be assisted by the general clinical picture and by abnormal thoracic sounds it must be remembered that this condition produces a syndrome largely abdominal in nature and diagnosis is most likely to be confirmed by exploratory laparotomy.

*Editor's Note: The second part of this paper will be published in the next issue.*

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## Five Suggestions for New Vets

1. **Listen** to the old vets.
2. **Ask questions** when they're not speaking.
3. **Think** about what they've said.
4. **Read** the book again.
5. **Do** what your own professional conscience demands.

Recent Graduate