



Description of clinical cases of diseases of the thorax by means of ultrasonographic examination in sheep

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ABSTRACT

This article presents ultrasonographic and post-mortem findings from a wide range of common ovine diseases, in which provisional veterinary diagnosis was confirmed by using ultrasonography at the time of the first clinical examination and without recourse to additional, potentially expensive, diagnostic facilities. Furthermore, cases studies are presented of conditions and diseases not previously reported in the veterinary literature, where further investigations and the eventual diagnosis was greatly facilitated by ultrasonographic findings. The article seeks to further develop the application of diagnostic ultrasonography in everyday small ruminant practice.

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1. Introduction

The principles and applications of ultrasonographic examination of the thorax and abdomen have been presented in a previous paper, as part of a detailed examination of sheep with relevant problems (Scott, 2017a,b). Objective of the present paper is to describe clinical cases of respiratory, liver and urinary tract problems in sheep, in which ultrasonographic examination has been employed in the diagnostic process. It is recommended that readers follow the flow of description of each case and take a sequential reading and viewing before reading the conclusion of each case.

2. Case reports

2.1. Case 1

A 4-year old ewe that was bright and alert with a normal appetite, was presented with increased respiratory rate with a marked abdominal component. The ewe was in poorer bodily condition than other sheep in the group, despite an apparently normal appetite. The clinical presentation is shown in Suppl. material 1.

The ultrasonographic examination (presented in Suppl. material 2) revealed sharply demarcated area of consolidation representing pulmonary adenocarcinoma tumour, extending for approximately 6 cm into the lung parenchyma (dorsally and to the left) and

liver (ventrally and to the right), separated by the diaphragm (broad hyperechoic line); the findings demonstrate the 'hepatoid' echogenic nature of the tumour mass.

The post-mortem findings are presented in Suppl. material 3. The sharply demarcated pulmonary adenocarcinoma tumour mass in the diaphragmatic lobe explained why it could be imaged in the same field as the liver, with a similar sonographic appearance illustrating the cellular density of the tumour.

2.2. Case 2

Two 4-year old ewes were presented in much poorer bodily condition than other sheep in the group, despite good grazing conditions. Both ewes were found to be bright and alert, but had increased respiratory rate with a marked abdominal component. The clinical presentation is shown in Suppl. material 4.

Ultrasonographic examination performed at the farm (presented in Suppl. material 5, 6) revealed a very sharply demarcated area of consolidation ventrally (to the right) representing pulmonary adenocarcinoma tumour, extending for approximately 6 cm into the lung parenchyma; normal lung dorsally (to the left) was represented by the continuous bright hyperechoic visceral pleura.

The post-mortem findings are presented in Suppl. material 7. The sharply demarcated tumours were clearly shown in post-mortem examination.

This case report illustrated the application of ultrasonography in reaching a specific diagnosis immediately, in this case pulmonary adenocarcinoma, which was then confirmed by the

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post-mortem findings. Based on the results, a plan can be formulated to control/eliminate this disease, whilst the veterinarian is still on the farm. Crucially, the post-mortem findings in this situation demonstrated to the owner the application and specificity of ultrasonography in the diagnosis of pulmonary adenocarcinoma and the central role of the veterinarian in disease control.

2.3. Case 3

A valuable ram was reported losing body condition (body condition score 1.5 on the scale 1–5), despite an adequate ration; another 25 rams in the same group were in good condition (body condition score 3–3.5). The sheep were housed for four months during the winter. An increased respiratory rate was noted in the animal during clinical examination, but its rectal temperature was normal.

Ultrasonographic examination (presented in Suppl. material 8) revealed a sharply demarcated area of consolidation representing pulmonary adenocarcinoma tumour, extending for approximately 3–4 cm into the lung parenchyma (cardiac lung lobe); the heart was imaged in the lower right side of the sonogram; there was a 2 cm-diameter abscess within the tumour mass, at the junction with normal lung dorsally (to the left).

The post-mortem findings are presented in Suppl. material 9. The sharply demarcated tumour mass was clearly visible at post-mortem examination, with several abscesses within it; the central abscess was probably that imaged in the video recording. The specific diagnosis of pulmonary adenocarcinoma permitted immediate culling, before further spread of the causal virus to other valuable rams in the group.

2.4. Case 4

A 2-year old ewe was presented bright and alert, with a normal appetite, but with a markedly increased respiratory rate with a pronounced abdominal component. The ewe was in poorer bodily condition than other sheep in the group, despite an apparently normal appetite. There were no lung sounds audible on the right side of the chest and the heart sounds were much reduced. Increased audibility of normal breath sounds were heard on the left side of the chest with increased heart sounds. The clinical presentation is shown in Suppl. material 10.

Ultrasonographic examination (presented in Suppl. material 11) revealed a unilateral well-encapsulated fibrinous pleurisy, with a hyperechoic lattice-work within a large anechoic area extending to 15 cm from the chest wall; the well-organised appearance of the fibrin clot suggested that it could have developed over several weeks; the lung surface was not imaged dorsally.

This ewe failed to respond to antibiotic administration and was euthanised on welfare grounds. On other occasions, sheep with less severe fibrinous pleurisy lesions have responded well to treatment with procaine penicillin.

2.5. Case 5

A 4-year old ewe was presented bright and alert, but in poorer bodily condition than other sheep in the group. During clinical examination, lesions 6–8 cm in diameter were observed in the left mammary gland, which resembled strongly to encapsulated abscesses (Suppl. material 12); the respective teat was enlarged and purulent material could be expressed.

Ultrasonographic examination (presented in Suppl. material 13) revealed separation of the pleurae by a 5–8 mm thick anechoic layer dorsally, which increased in width as the probe head moved ventrally; there was also fibrinous pleurisy (fine hyperchoic strands within the anechoic area) ventrally, which extended to 5 cm and onto the diaphragm; the liver was visible on the other side of the

broad convex hyperechoic line representing the diaphragm. Post mortem findings (presented in Suppl. material 14) indicated that the extent of the pleurisy was evident from this image and corresponded well to the sonographic findings.

Further, ultrasonographic examination (presented in Suppl. material 15) revealed separation of the pleurae by a 2–3 mm thick anechoic layer dorsally, which increased in width as the probe head moved ventrally; there were several 2–3 cm in diameter anechoic areas, with hyperechoic boundaries typical of abscesses; the fibrinous pleurisy was not nearly as extensive as on the right side of the chest. Mastitis was long-standing and unlikely to have been the cause of weight loss in this ewe; however, the extensive bilateral pleurisy was considered unlikely to respond to antibiotic therapy and, hence, the ewe was culled for welfare reasons. In post-mortem findings (presented in Suppl. material 16), pleurisy, particularly affecting the ventral margins of the left lung, was evident.

2.6. Case 6

A 4-year old ewe was examined for pulmonary adenocarcinoma, as part of a flock investigation for presence of the disease.

Ultrasonographic examination (presented in Suppl. material 17, 18) revealed several 5–8 mm anechoic areas on the visceral pleura distributed over the lung surface; these areas had an obvious hyperechoic margin, but it was not possible to ascertain nature of these lesions.

The post-mortem findings are presented in Suppl. material 19. Lesions at the visceral pleura were found to be small abscesses following bacteraemic spread, which highlighted the difficulty in differentiating sonographic findings smaller than 1–2 cm in diameter, which involved the visceral pleura.

2.7. Case 7

A 4-year old ewe was examined for pulmonary adenocarcinoma, as part of a flock investigation for presence of the disease. The animal had no history of illness and was bright and alert; the shepherd reported to have observed nothing untoward with this sheep. Body condition score of the animal was found to be 2.5 (on the 1–5 scale) consistent with that of other animals in the flock. The clinical presentation is shown in Suppl. material 20.

Ultrasonographic examination (presented in Suppl. material 21, 22) of the right chest revealed normal lung (Suppl. material 21) with the normal continuous hyperechoic visceral pleura moving in time with respiration; on the left side, there was a well-encapsulated anechoic area extending to 8 cm in diameter, containing broad hyperechoic fibrinous strands moved by the adjacent beating heart; although this sonographic picture was not dissimilar to some cases of septic pericarditis in cattle (Suppl. material 23), the present case was not diagnosed as pericarditis, because the lesion was unilateral and did not surround the heart; the sonographic findings in this animal were consistent with a very large fluid-filled abscess; the well-developed capsule would explain the normal clinical appearance of this sheep.

Subsequently, the animal was re-examined two months later, when the lesion had extended to 12 cm in diameter, with large fibrinous clots clearly visible (Suppl. material 24), and had been confirmed at post-mortem examination (Suppl. material 25). The sheep had remained in good health and had shown no signs of illness and was culled for another reason.

2.8. Case 8

Four ewes were presented for investigation of chronic body-weight loss. The farmer considered that the most likely cause was ovine pulmonary adenocarcinoma; animals had been tested clini-

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