Radiographic Examination of the Lungs and Thorax Cavity in Equine

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ABSTRACT

The aim of the study was to identify the area and the radiological procedure and parameters for lungs and thorax examination in horses, using a mobile double arms X-Ray device.

The study was conducted on 10 horses that were presented to the radiology clinic for pulmonary investigation. The study was conducted using a double arms X-Ray device. The patients were clinically evaluated and for the radiological investigation the horses were sedated and a helper restrained also the patient in a proper position.

The mobile arms of the device give the possibility of adjusting the distance between the X-Ray tube and the detector, because of these one or two exposures were enough to examine the entire thoracic cavity. The interstitial pattern is more evident in horses than in small mammals given the gross anatomy of the lungs. The radiological parameters were adjusted according to thoracic cavity depth. Radiographic examination is a necessary tool that completes the clinical examination. The up-to-date detectors used in veterinary radiology give the clinician the possibility of a detailed examination of the lung parenchyma and the thorax structures.

Keywords: *lungs, horses, lungs pattern, lung radiography*

INTRODUCTION

Radiographic evaluation of the thorax and the lungs in horses prove to be rather difficult given the dimension and the topography of the organ. Interpretation of the equine lung radiography requires deep knowledge of gross anatomy of equine lung and lung pattern recognition (Sande and Tucker, 2004). Describing the radiological finding in horse lung often is based on the findings from other species (dogs, cat), but we have to take in consideration the changes in distribution of pattern based on gross anatomy of the horse lungs (Frase and Paré, 1977; Chen *et al.*, 1992; Smith *et al.*, 1994; Lakritz *et al.*, 1994; Tucker, 2002).

MATERIAL AND METHODS

The study was made on 10 horses that were brought to the radiology department with

different pathology. The aim of the study was to identify the area and the radiological procedure and parameters for lungs and thorax examination in horses, using a mobile double arms X-Ray device. The study was conducted using a double arms X-Ray System Synthesis device (producer General Medical Merate SpA Italy) and the images were acquired using a DR flat panel. Before the radiological examination the coat of the patient was clean to remove any traces of dirt that could interfere with the radiological examination. The patients were clinically evaluated and for the radiological investigation the horses were sedated and a helper restrained also the patient in a proper position. The patient data (weight, wither high, thorax diameter) and the value for the radiographic examination were registered (Table 1). The body measurements were recorded

base on the data given by the owner. For each horse a set of 3 radiography, using different kilo voltage and miliamperage, were performed, each radiography being evaluated by two radiologists. The evaluation consists in identifying the best image in correlation with the parameter and not to evaluate the observation capacity of the radiologists involved. In the present paper, the most relevant images compared with the parameter were discussed.

RESULTS AND DISCUSSIONS

The radiographic evaluation of the lung in horses is done after a thorough examination of the

patient by a clinician. The role of the radiography is to confirm or to infirm a presumptive diagnostic (Butler *et al.*, 2000; Farrow, 2002).

The examined patients were hold in standing position and the radiographic evaluation was performed by latero-lateral exposure. The mobile arms of the device give the possibility of adjusting the distance between the X-Ray tube and the detector; because of these one or two exposures were enough to examine the entire thoracic cavity (figure 1).

The interstitial patter is more evident in horses that in small mammals given the gross anatomy of the lungs. The radiological parameters

Tab. 1. Patient data

No.	Body weight (kg)	Height (cm)	Thorax (cm)	First exposure		Second exposure		Third exposure	
				kV	mAs	kV	mAs	kV	mAs
1	245	178	87	150	80.4	150	63.2	150	70.5
2	237	181	78	140	80.4	140	70.3	130	70.5
3	198	170	67	104	40.3	110	40.3	120	60.2
4	251	171	69	130	80.4	150	80.4	130	70.2
5	298	174	74	110	50.6	120	50.6	140	80.4
6	276	183	91	150	110	130	100	150	90.4
7	245	172	63	120	70.3	140	110	130	97.6
8	187	173	75	140	80.7	120	50.5	130	110
9	233	179	74	130	80.3	130	110	140	90.4
10	210	173	86	149	110	150	110	150	90

Fig.1. Latero-lateral evaluation of the cardiac and diaphragmatic lung-lobes in horse

were adjusted according to thoracic cavity depth. Evaluation of the ventral part of the thorax is necessary in the cases when is suspected an accumulation of liquid in the thoracic cavity, because of gravity the liquid will be located in the ventral site obstructing the view of the heart silhouette and the caudal vena cava (figure 2 a, b). In case of liquid accumulation an alveolar pattern should be present due to consecutive compression

edema. The horse thorax varies in diameter, because of that it is necessary to make several radiographies with different parameters in order to highlight all the aspect that could appear in the lung parenchyma. Lowering the miliamperage help put in evidence the edema in case of a liquid accumulation (figure 3.)

Changes in the kilo voltage give a high penetration power and help remove artifacts that obstruct

Fig. 2a. Latero-lateral exposure, 150 kV, 80.4 mAs, liquid accumulation with shading of the heart

Fig. 2b. Latero-lateral exposure, 150 kV, 63.2 mAs, the edema in the lung parenchyma become evident

a proper viewing of the bronchia and the interstitial tissue (figure 3, figure 4, figure 5, figure 6).

Increasing the kilo voltage help remove the breathing artifacts (figure 5, figure 6, figure 7).

CONCLUSION

For a proper evaluation of the thorax cavity in horses, a thorough cleaning of the coat is

necessary, also a proper sedation and handling is required. To perform a full scan of the thorax the radiography should cover all the thoracic area and sequential exposure will be made. For avoiding the breathing artifacts an increasing of the kilo voltage is required. The parameter will be adjusted according to the thorax diameter: for a 60 cm thorax diameter good images were

Fig. 3. Latero-lateral exposure of the upper quarter of the thorax, 104 kV, 40.3 mAs, interstitial tissue is reacted, loss of bronchial details

Fig.4. Latero-lateral exposure of the upper quarter of the thorax, 110 kV, 40.3 mAs, presence of calcification area in the lung, reaction of the bronchia

obtained using 120 kV with 60-70 mAs; for 80 cm thorax diameter – 140 kV with 80 mAs; for over 80 cm thorax diameter – 150 kV with 90-110 mAs.

Fig. 5. Latero-lateral exposure of the upper quarter of the thorax, 140 kV, 80.4 mAs, the image is blurred because of respiratory artifacts

Fig. 6. Latero-lateral exposure of the upper quarter of the thorax, 150 kV, 80.4 mAs, the image is not so much subjected to artifacts and more details are evident

Fig.7. Latero-lateral exposure of the upper quarter of the thorax, 130 kV, 110 mAs, pulmonary bronchiogram and alveolar pattern with lung bronchiectasis

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