BEYOND THE NORM: COMPUTED TOMOGRAPHY AS A DIAGNOSTIC PIONEER IN LABRADOR RETRIEVER MULTICENTRIC LYMPHOMA

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Abstract

This study aims to demonstrate the potential of computed tomography (CT) as a valuable diagnostic tool for multicentric lymphoma in a 5-year-old female Labrador retriever weighing approximately 27 kg. The dog was brought to the Small Animal Medicine outpatient unit of Madras Veterinary College due to inappetance, generalized lymphadenopathy, and impaired vision. Preliminary diagnostic tests such as radiography, ultrasonography, and fine needle aspiration cytology (FNAC) of the lymph node suggested lymphoma. To confirm the diagnosis, a CT scan was performed on the patient under mild anesthesia. The CT scan revealed significant changes in the spleen and other abdominal organs, confirming the presence of multicentric lymphoma. Compared to traditional X-ray imaging, CT offers several advantages for diagnosing this condition. By providing cross-sectional images of internal organs, CT allows for more accurate and comprehensive evaluation of the affected areas. Conventional X-ray imaging is limited in this regard due to the superimposition of structures. In conclusion, this case study highlights the importance of incorporating CT scans into the diagnostic process for multicentric lymphoma in dogs. The ability to obtain detailed cross-sectional images of internal organs can significantly improve the accuracy of the diagnosis, ultimately leading to more effective treatment and better patient outcomes.

Keywords: Computed Tomography scan, multicentric lymphoma, lymphadenopathy, Radiography.

Introduction

Multi centric lymphoma is a common malignancy in dogs, accounting for approximately 7-24% of all canine neoplasms (Vail and MacEwen, 2000). Labrador retrievers, in particular, have been reported to be predisposed to this disease (Grüntzig et al., 2016). The accurate diagnosis and staging of multicentric lymphoma are essential for determining the most appropriate treatment options and predicting the prognosis for affected dogs (Owen et al., 2014). In recent years, computed tomography (CT) has emerged as a valuable diagnostic tool for evaluating patients with suspected multicentric lymphoma (Bertolini, 2010). The gold standard for diagnosing multicentric lymphoma in dogs is histopathological examination of lymph node biopsy samples (Owen et al., 2014). However, this invasive procedure carries risks, including anesthesia complications, hemorrhage, and infection (Sharkey et al., 2007). Moreover, histopathological evaluation alone may not provide sufficient information about the extent and distribution of the disease in the body, which is crucial for determining appropriate treatment strategies and predicting prognosis (Owen et al., 2014). CT

has been widely used in human medicine for the evaluation of lymphoma patients, providing valuable information about the size, location, and extent of lymphadenopathy, as well as the involvement of other organs (Cheson et al., 2007). In veterinary medicine, several studies have demonstrated the utility of CT for diagnosing and staging canine multi centric lymphoma. For example, a study by Bertolini et al. (2012) reported that CT was more sensitive than clinical examination for detecting lymphadenopathy in dogs with multicentric lymphoma, particularly for deep abdominal and thoracic lymph nodes. Similarly, a study by Spodnick et al. (1992) found that CT had a higher sensitivity for detecting mediastinal masses and lymphadenopathy in dogs with thoracic lymphoma compared to radiography. CT has several advantages over other imaging modalities for evaluating dogs with suspected multi centric lymphoma. Unlike radiography, CT can provide detailed cross-sectional images of the body, allowing for more accurate assessment of lymph node size and the involvement of adjacent structures (Bertolini, 2010). CT is also superior to ultrasonography for evaluating deep lymph nodes and organs, as it is not limited by the acoustic window or operator dependence (Nyman et al., 2015). Furthermore, CT can be performed rapidly, with a whole-body scan taking only a few minutes, minimizing the duration of anesthesia and stress to the patient (Bertolini, 2010).

Despite the increasing use of CT in the diagnosis and staging of canine multicentric lymphoma, few studies have specifically investigated its utility in Labrador retrievers. This breed has a higher predisposition for developing multi centric lymphoma and may present with unique clinical features compared to other breeds (Grüntzig et al., 2016). Therefore, further research is needed to determine the diagnostic performance of CT for detecting and staging multicentric lymphoma in Labrador retrievers.

CT has emerged as a valuable diagnostic tool for evaluating dogs with suspected multicentric lymphoma, offering advantages over other imaging modalities in terms of sensitivity, accuracy, and speed. While there is substantial evidence supporting the utility of CT for diagnosing and staging canine multicentric lymphoma in general, further investigation is warranted to confirm its performance in Labrador retrievers, a breed with a higher predisposition to this disease.

History and Clinical Examination

A 5-year-old female Labrador retriever weighing around 27 kg with a history of generalized lymphadenopathy, inappetence and loss of vision for the past 15 days was presented in the small animal outpatient unit of Madras Veterinary College. Ophthalmic examination revealed the absence of menace and pupillary reflexes on both eyes. On palpation, all peripheral lymph nodes were enlarged.

Blood and serum samples were collected for analysing the haematological and serological parameters. Haematogram revealed hypochromasia and relative neutrophilia, whereas no changes were observed in the serum biochemistry profile except for the mild elevation in the ALP values. Ultrasonography revealed hepatomegaly, splenomegaly with enlarged mesenteric lymph nodes. Radiography of the thoracic and abdominal view revealed intra-thoracic mass, bronchial pattern of the lungs and sub lumbar lymph node enlargement respectively. Fine needle aspiration biopsy was taken from left popliteal lymph node and confirmed as lymphoma on cytological examination. PARR assay and immunohistochemistry were confirmative for T cell lymphoma. PARR assay

revealed T cell clonalization and moderate expression of CD3+ and negative expression of CD79a were observed in immunohistochemistry. **Diagnosis and treatment**

Following a 12 hr fast, a whole body CT scan was performed on the animal with the help of Toshiba Alexion CT scanner. The animal was placed in the gantry opening of the CT scanner. CT scan procedure was done under General anaesthesia using Inj. Propofol @ 4mg/kg and maintenance with Isoflurane inhalation anaesthesia. TOSHIBA CT Alexia 16 slice was used for the study. 5 mm slice thickness, ME 100 kVp 120 and window length 380 and window 40 factor were visualized for CT study. CT slices were made in sternal recumbency of the animal. Axial, Coronal and saggital planes, multiplanar reconstruction and 3D reconstruction software were used for the study of Lymphoma. Hypoattenuating nodules and homogenous enlargement were seen within the liver, hyperattenuating mass were seen in parenchymal region in dorsal and ventral abdomen. In skull CT, retropharyngeal lymphnodes and mandibular lymphnodes were enlarged. These findings corelate with the earlier findings. Homogenous enlargement of the spleen was appreciable having diffuse infiltration. Metastases is evaluated as hypoattenuating nodules or masses distributed throughout the parenchymal region (Fig 1). This correlates with diffuse hypoechogenicity indicating lymphoma (Nerschbach *et al.,* 2016).
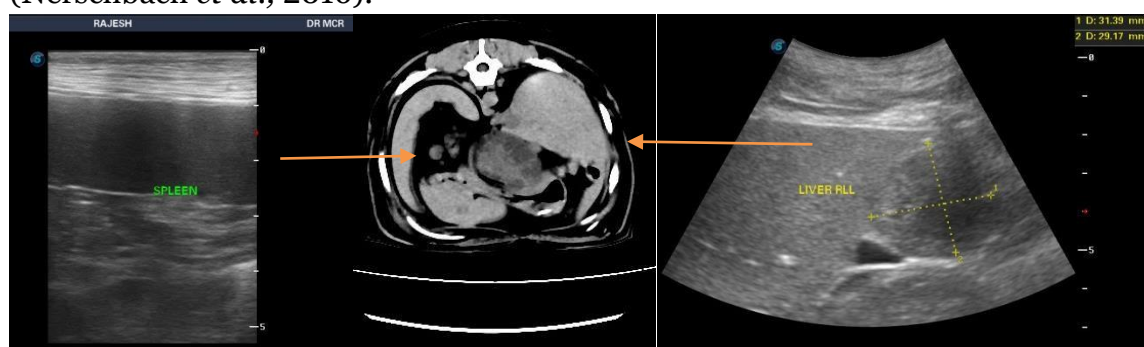

Fig1. a) Ultrasonography of spleen, b) CT scan of abdomen depicting enlarged spleen and liver and c) ultrasonography of liver

The gastric wall is markedly thickened as observed in ultrasonography, having mural thickening and calcification. The mesentry is isointense (Fig 2).

Fig 2. a) Ultrasonography of abdomen depicting thickened mucosal wall, b) & c) CT scan of abdomen featuring abdominal organs, depicting enlarged spleen and liver.

The gastric wall is markedly thickened as observed in ultrasonography, having mural thickening and calcification. The mesentry is isointense.

Chemotherapy was administered by following the 25 week CHOP therapy (Wisconsin – Madison protocol). The animal developed partial seizures, lethargy, inappetance and vomiting. Fluid therapy was administered such as Ringer's lactate. Ondansetron and Pantaprazole was given to the patient to treat vomiting. As the symptoms persisted, the animal was euthanized upon the owners's request.

Discussion

Recent advancements in the diagnostic methodology has made more prompt assessment of lymphoma. Diagnosis of liver and splenic lymphoma based on the radiography studies alone

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can result in false positive judgement. (Nerschbach *et al.*, 2016). Computed tomography gives additional information in staging malignant diseases in canine. (Seiler *et al.*, 2015). Changes on the liver parenchyma due to lymphoma is quite challenging with Radiographic and ultrasonographic diagnosis. CT scan study of liver is helpful in identifying the hepatic lymphoma well in advance. This particular case showed the involvement of liver, spleen and mesenteric lymphnodes.This helped us assessing chemotherapeutical response also. In conclusion, this case describes the relative benefits of CT in veterinary practice in particular, in the diagnosis of canine lymphoma. The application of the CT imaging in the diagnosis of splenic, mesenteric lymphoma is appreciable and novel. Further inclusion of these diagnostic procedures will help in decision making procedure. This will enable us in arriving at the right diagnosis, conclude the right prognosis pertaining to canine lymphoma and necessitate treatment in the form of chemotherapy and further evaluation of the response to therapy. CT investigation threw light on the involvement of liver and spleen and further ascertaining stage/grade of lymphoma and also subjecting the cases to CT scan before and after chemotherapy will aid in the assessment of regression of the mass. In this study we were able to stage the lymphoma as multicentric stage IV$_a$ as per WHO guidelines. The dog was treated using a combination of chemotherapeutic agents as per the Madison Wisconsin University protocol. This CT scan study was utilized in one single case. Hence if we use CT scan to study more number of cases, we will be able to derive more accurate information even up to minute level.

Acknowledgement

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