Original Article

JVC Journal of Veterinary Clinics

pISSN 1598-298X • eISSN 2384-0749
J Vet Clin 2023;40:104-112
https://doi.org/10.17555/jvc.2023.40.2.104

Assessment of Abdominal Organs Movement by Respiration Using Computed Tomography in Dogs: A Pitfall for Radiation Therapy

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Abstract The change in the position of the abdominal organs due to movement by respiration is one of the reasons behind inaccurate irradiation of organs during radiotherapy (RT). Although studies in human medicine have revealed on the respiratory movements of abdominal organs, there is little information and no reference data for dogs. The purpose of this study was to establish the reference values of abdominal organs movement in various postures using computed tomography (CT), and to compare the movements of organs between dorsal recumbency and ventral, right and left lateral recumbency during respiration. CT images for kidney, adrenal gland, medial iliac lymph node, urinary bladder, gallbladder, liver, stomach, and thoracic and lumbar vertebral body of five beagle dogs were acquired. The movements of organs were evaluated by comparing the end-expiratory and end-inspiratory images. Movements of the organs were evaluated by dividing it into right-to-left, dorsal-to-ventral, and cranial-to-caudal directions. The movements of abdominal organs according to the change in postures and respiration were establish. The movement of the bilateral organs was the least when the organs were in the downward position ($p < 0.017$). The movement of cranial-to-caudal direction was greater than the movement of the other directions in most of the organs. Data obtained in this study may be useful in selecting the appropriate posture that can reduce the movements of organs to be treated with RT, and the data could be useful for setting the planning target volume to consider the movements of the abdominal organs by respiration.

Key words canine, respiration, abdominal organs movement, posture, radiation therapy.

Received January 27, 2023 / Revised March 13, 2023 / Accepted March 20, 2023