Studies on the adjacent segment disease of the cervical spine in dogs

Abstract of Doctoral Thesis

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Cervical intervertebral disc herniation (C-IVDH) and caudal cervical spondylotic myelopathy (CSM) are commonly diagnosed neurosurgical disorders in the caudal cervical region of dogs. Clinically, as a treatment for C-IVDH and CSM, either ventral slot decompression (VS) or vertebral fixation (VF) is applied. Although postoperative instability and subluxation are serious complications with VS, these are considered preventable by combining VF. However, after VF, the risk of similar lesions in the adjacent segment (domino lesions) has been reported. In domino lesions, abnormal mechanical environment occurs in the adjacent segment by VF, promoting potential instability, and leading to extrusion of nucleus pulposus or hypertrophy of annulus fibrosus. There are only limited reports on the pathology of the adjacent segment disease and biomechanical and molecular mechanisms are still unknown in dogs. However, it is essential to study these mechanisms in order to clarify the pathology of the adjacent biomechanical disease. Furthermore, it is also necessary to consider the epidemiological features in order to make a more detailed study. Therefore, the purpose of this study is to clarify the pathology of the adjacent segment disease of the cervical spine in dogs.

In this study, the occurrence of adjacent segment disease after surgical treatment with cervical spinal disease in dogs was investigated restrospectively. As a result, the occurrence of adjacent segment disease is likely to occur after VF compared to the after VS and significant association between VF implementation and the occurrence of the adjacent segment disease was observed. Therefore, it was suggested that adjacent segment disease possibly associated with the stabilization surgery. In addition, a cervical spine model was created using specimens obtained from healthy beagles, and the effect on the adjacent segment after VF was examined using a 6-axis material tester. The range of motion at the adjacent segment increased significantly in the VF model, suggesting that VF can change the mechanical environment at the adjacent segment and may cause adjacent segment disease. Also, by creating an in vivo vertebral fixation model in healthy beagles, the effect of the changes in the biomechanical environment of adjacent

segments was evaluated. The results suggested that due to vertebral fixation, degeneration of not only the intervertebral disc nucleus pulposus but also the annulus fibrosus progressed, leading to the development of adjacent segment disease.