Histological Aspects of Spinal Cord In Some Traumatic Lesions of Vertebral Column Identified by Computed Tomography

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Abstract. Fractures of vertebral column were studied by radiology, mielography and computed-tomography in 11 adult dogs with street accidents. Computed-tomography allowed the localization and evaluation of degree of compression of spinal cord. Spinal cord compression was induced both by dorsal vertebral arch and by vicious calluses of vertebral body. The compression realized by dorsal vertebral arch induced a primary trauma on dorsal and dorso-lateral part of spinal cord affecting the fascicles involved in proprioceptive transmission and voluntary movements. 5 patients were euthanised and the histological exam of the spinal cord at the site of compression revealed: necrosis of the neurons both in grey and in white matter, their replacement by numerous astrocytes, vacuolization, demielinization of the axons of spinal nerve roots.

Key words: dog, spinal cord, computed tomography, histology

Computed tomography is used for diagnosis of traumatic, neoplasia, congenital, inflammatory or degenerative lesions of many organs (2, 4, 5, 7). The goal of the study was to evaluate the site and degree of medular compression, and the histological lesions of spinal cord in dogs with trauma of spinal cord.

MATERIALS AND METHODS

Fractures of spinal cord were studied in 11 patients. Each patient was evaluated both clinically, by neurological and phisical exam and paraclinically (haematologic exam, blood biochemistry for liver and kidney prophyle, exam of cerebrospinal fluid) and by imagistic exam. Direct radiography and then mielography were performed to localize the traumatic lesion. Computed tomography – using the Siemens Emotion equipment was made both directly and with iodine contrast substance (Scan Lux, i.v., 750 mg/kg). The animals were generally anesthesied with medetomidine 0,03 mg/kg and ketamine 0,3 mg/kg. 5 patients were euthanised and the spinal cord from the site of compression were prepared for histological exam using paraphin embedding method and HEA, PAS and Gomori stains.

RESULTS AND DISCUSSION

For all the 11 patients the cause of the fracture was the street accident. The most frequently involved were the segments Th3-L3 (in 9/11 patients). The segment L4-S3 of spinal cord were affected in 2/11 cases.

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In patients with fracture of Th9-L1 segments paraparesis were installed suddenly, with signs of upper motoneuron (normo- or hyperreflextivity of patellar and flexion reflexes), proprioceptive deficiency and hypersensitivity band at 1 or 2 vertebra after the site of traumatism. Deep pain – 4 hours after the trauma – was observed in 8/11 patients.

In patients with fracture of L4-S3 the signs of lower motoneuron (4) were observed (hipo- or areactivity for patellar and flexion reflexes), faeces incontinency and partial urine incontinency, and absence of proprioception. Radiology evidentiated the site of spinal cord injury. Computed tomography allowed the localization and evaluation of degree of medular compression. (Fig. 1-6)

Fig. 1 – Bichon, female dog, 3 years. Bone window. Fracture of vertebral arch of Th10, with reparation callus. Dorsoventral compression of medula.

Fig. 2 – The same case as in Fig.1. Bone window. Lateral reconstruction. Dorsal displacement of the medula and compression at the level of Th10.

In our cases spinal cord compression was induced both by dorsal vertebral arch and by vicious calluses of vertebral body. The compression realized by dorsal vertebral arch induces a primary trauma on dorsal and dorso-lateral part of spinal cord affecting the fascicles involved in proprioceptive transmission and voluntary movements.

The indirect compression realized by passing the spinal cord ventrally, on the bottom of vertebral channel, also induces a slight antegrad compression realized by congestion of intravertebral venous plexus. In severe cases, compression of spinal cord ventrally, on the bottom of vertebral channel, affecting the white substance of spinal cord induced the loose of cutaneous sensitivity and deep pain.
Histological exam of the spinal cord at the site of compression revealed: necrosis of the neurons both in grey and in white matter, their replacement with numerous protoplasmatic astrocytes, vacuolization, demielinization of the axons of spinal nerve root (Fig. 7-10), lesions also mentioned by other authors (3). In spite of vicious calluses observed, in surviving cases, the architecture of spinal cord sesms to progresively reorganize so as many of neurological defficiencies are recuperated during the time. Clinically, the evaluation of Olby score (6) for motility recuperation during 4 months was fair to good; aproximatively 2 point/month, from 1 ± 1 to 7 ± 2,5. The best Olby recuperation score was obtained in a patient with fracture of L3-S1, and cauda equina paresis, finally it being of 11.
CONCLUSIONS

1. Fractures of vertebral column were studied by radiology, mielography and computer-tomography in 11 adult dogs with street accidents.
2. Computer-tomography allowed the localization and evaluation of degree of compression of spinal cord.
3. Histological exam of the spinal cord at the site of compression revealed: necrosis of the neurons both in grey and in white matter, their replacement with numerous astrocytes, vacuolization, demielinization of the axons of spinal nerve root.

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