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羊脊髓慢性压迫合并急性压迫的MR扩散张量成像

Diffusion tensor imaging in spinal cord of goats under chronic compression complicated with acute compression

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中文摘要:

目的 观察羊脊髓慢性压迫合并急性压迫模型的MR扩散张量成像(DTI)表现。**方法** 健康山羊24只,随机分为A、B组,每组12只。A组为慢性压迫组,B组为慢性压迫合并急性压迫组。将导管球囊通过左侧C3-4椎间孔缓慢插入硬膜外腔。术后第11天经导管向球囊内注射生理盐水,对脊髓进行持续压迫。术后第62天,对B组再次经导管外口缓慢注射生理盐水。对动物进行运动功能评分、常规MR和DTI检查,测量受压脊髓的表现扩散系数(ADC)值和各向异性分数(FA)值。术后第63天对受压脊髓进行光镜、电镜检查。**结果** 两组动物术前脊髓运动功能评分均为5分,脊髓ADC值为 $(1.23 \pm 0.05) \times 10^{-3} \text{ mm}^2/\text{s}$,FA值为 0.72 ± 0.05 。术后第63天,A组动物评分降低至 (3.42 ± 0.43) 分,受压脊髓的ADC值升高至 $(1.43 \pm 0.05) \times 10^{-3} \text{ mm}^2/\text{s}$,FA值降低至 0.62 ± 0.07 ,与术前比较差异均有统计学意义($P < 0.05$)。B组动物评分降低至 (1.13 ± 0.35) 分,与术前比较差异有统计学意义($P < 0.05$);受压脊髓的ADC值为 $(1.26 \pm 0.06) \times 10^{-3} \text{ mm}^2/\text{s}$,与术前比较差异无统计学意义($P = 0.37$);FA值为 0.68 ± 0.06 ,较术前降低($P < 0.05$)。常规MRI均未见异常。两组病理学改变均有脊髓组织水肿、变性、坏死,白质内髓鞘板层状结构紊乱,B组局部细胞水肿更重,并有局灶出血。**结论** 脊髓慢性压迫基础上合并急性压迫时,病理学改变加重,ADC值、FA值可反而恢复正常或接近正常。

英文摘要:

Objective To explore the diffusion tensor imaging (DTI) manifestation in spinal cord of goats under chronic compression complicated with acute compression. **Methods** Twenty-four goats were divided into group A and B randomly: A balloon catheter was inserted into the epidural space at C3-4 level via intervertebral foramen for each goat. The balloon was inflated with injection of saline 11 days after the operation in both groups and again 62 days after the operation in group B. The locomotor rating score, conventional MRI and DTI were performed. The apparent diffusion coefficient (ADC) and fractional anisotropy (FA) values of compressed spinal cord were measured. Histopathological assessment of the compressed spinal cord was performed 63 days after the operation with light microscope and transmission electron microscopy. **Results** Before operation, in the 2 groups, the locomotor rating score was 5, the ADC value was $(1.23 \pm 0.05) \times 10^{-3} \text{ mm}^2/\text{s}$ and the FA value was 0.72 ± 0.05 . On the 63rd day after operation, the locomotor rating score decreased to 3.42 ± 0.43 , the ADC value at compression site increased to $(1.43 \pm 0.05) \times 10^{-3} \text{ mm}^2/\text{s}$ and the FA value decreased to 0.62 ± 0.07 in group A (compared to those before operation, all $P < 0.05$), while in group B, the locomotor rating score decreased to 1.13 ± 0.35 (compared to that before operation, $P < 0.05$), the ADC value at compression site was $(1.26 \pm 0.06) \times 10^{-3} \text{ mm}^2/\text{s}$ (compared to that before operation, $P = 0.37$) and the FA value restored to 0.68 ± 0.06 (compared to that before operation, $P < 0.05$), but no abnormality on conventional MRI was found. Pathological changes including swelling and degeneration of axons and neurons as well as the disarrangement of myelin sheathes could be seen in both groups, while more severe swelling and focal hemorrhage were noticed in group B. **Conclusion** In spinal cord of goats under chronic compression complicated with acute compression, pathological changes became more severe while the ADC value and the FA value restored to normal or near normal.

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