

# 脊髓 II 号治疗大鼠脊髓损伤的电生理研究

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**摘要** 制作 18 只 T<sub>12</sub>右半横断的 Wistar 大鼠模型, 随机分为三组: 脊髓 II 号组、激素组、空白对照组, 分别给予脊髓 II 号方剂、激素、生理盐水, 并观察动物行为变化。4 周后, 以电生理学方法测定运动诱发电位和感觉诱发电位, 评价其功能恢复。发现脊髓 II 号方剂具有良好疗效, 并在一定程度上优于激素。

**关键词** 脊髓损伤 诱发电位 脊髓 II 号

应用中药方剂治疗大鼠急性脊髓损伤取得一定疗效<sup>〔1〕</sup>, 在此基础上筛选出脊髓 II 号方剂 (主要成分有: 人参、白术、茯苓、黄芪、当归、五味子、防己、甘草), 采用电生理学方法对其疗效和促进脊髓修复再生的机制作进一步研究。

### 实验材料及方法

采用 18 只成年 Wistar 大白鼠, 以 11 号手术刀片将其第 12 胸髓 (T<sub>12</sub>) 右半侧切断, 彻底止血并逐层缝合。

把它们随机分为 3 组, 每组 6 只。第 1 组为脊髓 II 号组, 每日灌喂脊髓 II 号药液 (20g 生药量/kg 体重); 第 2 组为激素组, 急性期内 (2 周) 隔日腹腔注射氢化可的松 (10mg/kg 体重), 并给予庆大霉素 (6 万单位/Kg 体重) 腹腔注射; 第 3 组为空白对照组, 每日灌喂生理盐水。每日观察动物行为变化, 测定肌力和痛觉反射情况。

4 周后, 进行电生理学实验。(1) 运动诱发电位 (MEP) 测定: 将大白鼠用戊巴比妥钠腹腔注射麻醉 (30mg/Kg 体重), 固定于实验台上, 切开颅顶皮肤, 以台式牙科钻打开颅骨, 暴露左侧大脑皮层感觉运动区, 将刺激电极 (金制球形电极, 尖端直径 1mm) 置于该区硬脑膜上, 阴阳极相距 2mm。采用稳流刺激, 电流强度 10mA, 频率 300Hz, 方波时程 200 $\mu$ s, 间隔 1 秒。记录电极置于右下肢腓肠肌内, 正极位于近侧, 负极位于远侧, 相距 5mm。刺激电极和记录电极间置一地极。(2) 感觉诱发电位 (SEP) 测定: 麻醉、开颅与测定运动诱发电位时相同, 同时暴露并分离右侧大腿部坐骨神经, 将刺激电极平搭于坐骨神经干上, 阴阳极相距 2mm, 电流强度 1mA, 其余数据与运动诱发电位相同。记录电极置于左侧大脑皮层的运动感觉区, 两极相距 2mm。刺激电极与记录电极间置一地极。以光电 3 导 7103 型刺激器 (日本) 输出刺激, 并以光电 VC-10 双

线记忆示波器 (日本) 显示、记录。

### 实验结果

1. 实验大白鼠行为观察: T<sub>12</sub>损伤术后当日, 全部动物出现右后肢全瘫, 肌力 0 级 (个别动物出现双下肢瘫), 左后肢痛觉消失, 捏掐左足趾时, 左后肢无回缩反应, 右后肢痛觉大致正常。术后 5~6 日, 脊髓 II 号组大鼠右后肢运动功能开始恢复, 肌力 I~II 级, 左后肢痛觉有所恢复, 用力捏掐左足趾时, 左后肢出现不恒定的回缩反应。术后 7~8 日, 激素组大鼠开始恢复, 右后肢肌力 I~II 级, 左后肢有缓慢而不恒定的痛觉回缩反应, 但动物一般状况差, 明显瘦弱, 体毛倒竖, 无光泽; 但此时, 空白对照组尚无恢复。术后 2 周, 脊髓 II 号组大鼠右后肢已能做爬行运动, 肌力 III~IV 级, 左后肢痛觉接近正常水平; 激素组大鼠右后肢肌力 II~III 级, 左后肢痛觉回缩反应能引出; 空白对照组大鼠右后肢出现轻微活动, 肌力 I~II 级, 左后肢痛觉恢复不明显。术后 4 周, 脊髓 II 号和激素组大鼠右后肢运动能力和左后肢痛觉均接近正常水平, 肌力 IV~V 级; 空白对照组大鼠右后肢可作爬行运动, 肌力 II~III 级, 左后肢痛觉部分恢复。

### 2. 电生理实验结果

(1) 运动诱发电位 (MEP) 测定: 潜伏期、波幅见表 1, 空白对照组中有 2 只大白鼠没有记录到运动诱发电位。

表 1 运动诱发电位

组别	实验动物数	潜伏期 (ms)	波幅 (mv)
脊髓 II 号组	6	5.29 $\pm$ 0.494	0.03350 $\pm$ 0.00432
激素组	6	5.56 $\pm$ 0.284	0.01507 $\pm$ 0.00213
空白对照组	4	6.10 $\pm$ 0.235	0.00966 $\pm$ 0.00126

注: 大白鼠运动诱发电位正常值, 潜伏期 (ms): 4.96 $\pm$ 0.254, 波幅 (mv): 0.07667 $\pm$ 0.02549

(2) 感觉诱发电位 (SEP) 测定: 潜伏期、波幅见表 2, 空白对照组中有 3 只大白鼠没有记录到感觉诱发电位。

表 2 感觉诱发电位

组别	实验动物数	潜伏期 (ms)		波幅 (mv)	
		潜伏期 (ms)	波幅 (mv)	潜伏期 (ms)	波幅 (mv)
脊髓 II 号组	6	17.9±0.873	0.00562±0.000947		
激素组	6	19.4±0.707	0.00290±0.000341		
空白对照组	3	23.0±1.950	0.00205±0.000881		

注: 大白鼠感觉诱发电位正常值, 潜伏期 (ms): 14.7±0.513, 波幅 (mv): 0.00912±0.000488

由表 1 和表 2 可见: 脊髓 II 号组与空白对照组相比, 无论运动诱发电位还是感觉诱发电位, 在潜伏期及波幅上均存在明显差异 ( $P<0.05$ ), 脊髓 II 号组潜伏期

的延长及波幅的下降 (相对正常而言) 均少于空白对照组。脊髓 II 号组与激素组相比, 在诱发电位波幅上存在明显差异 ( $P<0.05$ ), 而潜伏期的差异不明显。各组间比较见表 3。

## 讨 论

1. 诱发电位在临床上应用广泛, 是脊髓损伤后判断损伤程度和预后的重要指标<sup>(1,2)</sup>, 其变化往往先于临床症状和病理切片表现出来。再生恢复较好的动物其诱发电位表现为潜伏期延长较少, 波幅下降较小, 而恢复不良的动物则相反。本实验中运动诱发电位主要检测中枢神经系统下行传导通路, 感觉诱发电位则检测上行传导通路的情况。实验中电生理指标与动物行为变化基本平行。

表 3 各组间比较

组间对比	运动诱发电位		感觉诱发电位	
	潜伏期有明显差异	波幅有明显差异	潜伏期有明显差异	波幅有明显差异
脊 II: 空白	是	是	是	是
脊 II: 激素	否	是	否	是
激素: 空白	否	是	是	否

注: 有明显差异即  $P<0.05$

2. 从实验动物诱发电位及行为变化上看:

(1) 脊髓 II 号组与空白对照组间存在明显差异, 提示脊髓 II 号方具有良好疗效。

(2) 脊髓 II 号组与激素组比较其意义在于: 激素是临床上治疗脊髓急性损伤的常用药物, 有一定的效果。本实验中两组在诱发电位的潜伏期上差异不显著, 但在波幅上却存在明显差异, 有学者认为脊髓机能的恢复与诱发电位的波幅密切相关, 在一定意义上波幅的变化较潜伏期更为重要<sup>(3)</sup>, 而且, 从动物的行为变化上观察, 脊髓 II 号组动物恢复较早, 一般状况也明显优于激素组。因此有理由认为脊髓 II 号方的疗效较激素为

佳。

## 参考文献

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## Abstract of Original Articles

**The Evaluation of Operation and Conservative Therapy on the Transient Contusion of Cervical Spinal Cord** *Fu Qin, Du Shixin, Zhang Yunqi, et al. The Second Clinical Institute, China Medical University, Shenyang (110003)*

The operation indication of the transient contusion of the cervical spinal cord has still not been very clear. Nine cases in total were studied. Among them, there were 3 cases treated with operation and the others with conservative therapy. The observation with Frankle evaluation had been followed up for 6–24 months. The results indicated that the spinal cord function of 3 cases in the conservative therapy group had been recovered basically to normal, and the function of hand in the operation group improved better than that in the former. It was suggested that the patients suffered from transient contusion, due to the injury of cervical spinal cord, should be treated, at first, with non-operative methods for 1–2 weeks; if the nervous function was not improved very well in this period, the operation should be applied as soon as possible, in order to recover the function of hand.

**Key words** Injury of spinal cord    Cervical vertebra MRI

(Original article on page 3)

**Complications following Treatment of Fracture with Orthofix Frame** *Zhang Kaifang, Wang Kunzheng, Liu Anqing, et al. The Second Teaching Hospital, Xian Medical University (710004)*

126 cases of limbs' fracture had been treated with Orthofix Frame since 1993, and bony union have been achieved in 124 cases. The complications induced by this kind of frame fixation are summarized as pain, bleeding and effusion from pin tract, injury of nerve, swelling at the distal part of limbs, retranslocation and refracture, delayed union, nonunion, and infection at pin tract, etc. The cause, prevention and treatment of such complications are discussed.

**Key words** Orthofix frame fixation    Complication Prevention and treatment

(Original article on page 6)

**Experimental Research on the Establishment of Osteoporosis Model in Pregeriatric Rat with Glucocorticoid** *Chen Dongyu, Shen Peizhi, Shi Yinyu, et al. Hospital of Shanghai Bao-Steel Metal Constructive Cooperation (200941)*

Owing to the effect of glucocorticoid, promoting bone substance absorption, the male pregeriatric SD rats had been injected intramuscularly with dexamethasone in different dosages (0.05, 0.1, 0.4mg/100g BW), and thereafter, the changes in bone density of whole body, volume of bone trabeculae, and intensity of anticurvation were observed. The experimental results demonstrated that all of these parameters are decreased significantly in middle dosage group ( $P < 0.05$ ); those parameters in low dosage group tend to decrease but without statistical significance ( $P > 0.05$ ). It is considered that the osteoporosis model in pregeriatric rats could be established by intramuscular injection of dexamethasone, in the dose of 0.25mg/100gBW, twice weekly, for 6 weeks.

**Key words** Glucocorticoid    Osteoporosis Pathologic model

(Original article on page 8)

**The Therapeutic Effect of Spinal Cord No. II on the Injury of Spinal Cord in Rats – Electrophysiological Study** *Liu Weidong, Han Fengyue. Institute of Orthopaedics and Traumatology, China Academy of TCM, Beijing (100700)*

The models of right hemi-transection of 12th thoracic spinal cord of 18 Wistar rats had been made and randomly divided into three groups. They were treated with Chinese herbs "Spinal Cord No. II", hydrocortisone, or normal saline respectively. The behavior changes of these experimental rats were observed daily, and the evoked electropotentials of the motion and the sensation were measured with electrophysiological methods for the evaluation of the function recovery after four weeks. It was discovered that there was good therapeutic effect of Spinal Cord NO. II, which was superior to that of hydrocorticoid in some extent.

**Key words** Injury of spinal cord    Evoked electric

potential Spinal Cord No. II (SC II)  
(Original article on page 10)

**The Effect of Various Flexion Angles of Knee Joint on the Stress of Patella — a Biomechanical Research** Chen Zhiping, Zhang Li, Zhang Anzhen. Institute of Orthopaedics and Traumatology, Fujian College of TCM, Fuzhou (350003)

The variation of patterns of patella stress under different flexion angles of knee joint and the effect of quadriceps force on patella stress under specified flexion angle were measured electrically on 6 fresh patellas of cadavers. The results demonstrated that under a constant quadriceps force, the strain of patella increased slowly as the flexion angles increasing from 0° to 40°, and the strain increased significantly as the flexion angles increasing from 40° to 90°. It was suggested that, especially as the flexion angle is over 40°, the effect of flexion angle of knee joint on the stress of patella should be taken into full consideration, for postoperative unburdened as well as burdened exercise of knee joint.

**Key words** Resistance strain Patella Strain Stress

(Original article on page 12)

**24 Cases of Postoperative Nonunion of Humeral Shaft Fracture** Luan Jinda, Li Yin, Wang Guanzhong. The First People's Hospital of Lianyungang, Jiangsu (222002)

24 cases of postoperative nonunion of humeral shaft fracture have been treated with satisfactory therapeutic effect. It was considered that the main causes of postoperative nonunion are the interference of operation, the unproper postoperative treatment, and the interference from local stress after operation. The key point to the prevention of postoperative nonunion is to master strictly the indication of operation. The principle of treatment of postoperative nonunion is rigid internal fixation and enough bone grafting.

**Key words** Humeral shaft fracture Nonunion Prevention and treatment

(Original article on page 15)

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