

悦肌灵搽剂对模拟登山肌痛家兔骨骼肌超微结构的影响

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摘要 以家兔超负荷运动方法模拟人体登山过度运动,探讨登山肌痛的病理及观察悦肌灵搽剂的治疗作用。结果表明:这种运动所致家兔肢体的功能状态与人体登山肌痛极为相似,骨骼肌超微结构呈显著损伤变化。悦肌灵搽剂能有效地抑制这种损伤并恢复肢体正常功能。

关键词 肌骨骼系统 悦肌灵 超微结构

登山肌痛是登山旅行的常见症候,是因登山过度不习惯运动所致。笔者采用家兔超负荷运动方法模拟登山过度运动,观察骨骼肌超微结构变化,探讨了登山肌痛的发病机理和悦肌灵搽剂的治疗作用。

材料与方法

选用北京军区医学校动物中心提供的同种健康青紫兰家兔 35 只,雌雄不拘,体重 2.2~2.5kg,随机分为实验组 (15 只),对照组 (15 只) 和正常组 (5 只)。先于实验环境每日将家兔固定于特制实验架上 3 小时,连续 3 日 (以适应实验环境)。其间,将左右肢前外侧脱毛,然后将家兔俯卧于实验架上,前后肢相对固定。实验组与对照组均以 DCQ-2 型电刺激器隔离输出成串脉冲方波,通过固定于左右肢的表面电极使股四头肌反复被动收缩运动,模拟登山时骨骼肌过度运动。刺激参数为:电压 8 伏,电流 4.4~7 毫安,波宽 300~500 毫秒,串脉冲频率 60 次/秒,串长 0.5 秒,每秒触发 1 次。其中,电流和波宽随收缩幅度减弱而逐渐增加。电刺激运动共 4 天,第 1、2 天每天进行 3 次,第 3、4 天每天 2 次。每两次之间间歇 2 小时,每次刺激进行 3 小时,每刺激 1 小时休息 10 分钟。正常组不予电刺激,余处理同实验组和对照组。

悦肌灵搽剂是由栀子、忍冬藤、防风、当归、鸡血藤、白芍、黄芪、桂枝、藿香、九味药制粗末,先收集挥发成分,再水煎 40 分钟,压榨去渣,离心过滤浓缩,掺入挥发成分,加入二甲

基亚砷水溶液,每毫升相当含生药 3.5g。对照用药为二甲基亚砷水溶液加曙红钠 0.1% 储备液配制而成,其外观与悦肌灵搽剂极为近似。

实验组从给予电刺激的第 1 天始,每日于股四头肌部位皮肤涂擦悦肌灵 1 次,共擦 5 天。对照组及正常组以同样方式涂擦对照用药。

在电刺激运动结束后 40 小时,将家兔以 25% 氨基甲酸乙酯 (4ml/kg) 静脉麻醉后,仰卧于兔解剖台上,逐次切皮分离组织暴露股外侧肌。首先,于此肌中 1/3 处按统一标准数取 1×1cm 方形范围内清晰可见的微小血管数目。然后,于此处滴加戊二醛数滴,快速切取肌肉组织约 1×0.8×0.8cm。生理盐水冲洗,常规戊二醛固定修整,纵切 3 块标示纵切面。以透射电镜样本制备的常规方法处理,在 H-500 透射电镜下按铜网孔逐个观察,选取较完整视野随机拍照,计算损伤肌节的百分比 (肌节损伤密度)。

结果分析

1. 后肢活动状态:对照组家兔从第 1 天刺激后,左后肢活动频率就显著下降,出现拖拉现象,呈肌肉活动受限,无力状态,股四头肌部位触之僵硬,至刺激运动结束后 40 小时,后肢几乎不再活动。实验组家兔在每日刺激结束后有轻度左后肢活动拖拉无力表现,但次晨活动自如,至刺激结束后 40 小时,其活动状态与对照组有显著差别,与正常组接近 (正常组家兔虽经固定,但解除固定后,活动、进食活跃)。表

明悦肌灵涂擦对这种运动后的肌肉活动不适有显著的抑制和恢复作用。

2. 股外侧肌外观微小血管数目分析: 如表 1 所示。实验组血管数目显著多于对照组, 对照组与正常组相近。而且, 实验组肌肉充血红润, 切取肌样本时出血量多, 对照组和正常组肌肉颜色较淡, 对照组个别家兔甚至呈苍白色, 切取肌样本时出血少或无出血。表明组间血液循环状况有显著差异, 悦肌灵涂擦可促进肌肉中血管网开放, 改善肌肉的血液供应和代谢。

表 1 股外侧肌外观微小血管数目比较

组别	n	微小血管数目	
		$\bar{X} \pm s$ (条)	P
实验组	15	11.357 ± 2.136	< 0.001
对照组	15	2.433 ± 2.487	
正常组	5	3.135 ± 1.044	> 0.05

3. 骨骼肌超微结构观察: 正常组家兔肌肉纵切面上, 肌细胞肌膜规整, 胞浆适中, 肌原纤维密集, 肌丝规则排列, 呈明暗交替状态, 线粒体嵴清晰有序。对照组家兔肌细胞显著肿胀, 胞浆增多, 肌膜严重变形而呈峰谷状, 肌原纤维松散, 大部分可见 Z 线扭曲; 肌丝稀疏, 排列紊乱或扭曲或断裂; 线粒体明显肿胀, 嵴断裂或消失, 增加放大倍数更可清晰看到这一变化。实验组家兔肌细胞无显著肿胀, 与对照组比较, 肌膜无显著变形, 肌原纤维尚可看到明暗交替状, 排列紧密, Z 线规整, 偶可见轻度肌丝紊乱或 Z 线模糊; 大部分线粒体形态正常, 轻微肿胀的线粒体或嵴不清者偶可见到, 但进一步增加放大倍数线粒体嵴仍清晰可见。

表 2 损伤肌节密度的比较

组别	n	损伤肌节百分比	
		孔个数	$\bar{X} \pm S$ (%)
对照组	8	38	30.12 ± 3.961
实验组	7	40	3.29 ± 2.032
正常组	4	28	0.21 ± 0.113

另外, 以计数损伤肌节的百分比统计肌节损伤的密度, 如表 2 所示。

对照组损伤密度极显著地高于实验组, 而实验组损伤密度亦仍高于正常组。表明实验组仍有损伤出现, 但涂擦悦肌灵后可使损伤的程度显著减小。

讨论

登山肌痛主要是登山结束后股四头肌、腓肠肌的疼痛或不适感, 是由于肌肉做不习惯的过度用力所致。该疼痛常于下山后 24 小时内出现并逐渐加剧, 24~72 小时达高峰, 5~7 天内消失, 自觉局部肌肉僵硬, 活动受限, 触之僵硬感。家兔股外侧肌经皮电刺激所致过度运动后肢活动受限状态, 可以模拟人体登山肌痛。表现为停止刺激数小时后, 被刺激后肢呈进行性活动次数减少、拖拉、活动受限, 受刺激的股外侧肌区域与未刺激的右后肢相应区域比较, 呈僵硬状态。同时, 骨骼肌超微结构呈显著的损伤性变化。由此可见, 登山肌痛可能与登山过度运动引起骨骼肌结构损伤有直接关系。肌细胞肌膜变形, 肌细胞水肿产生的压力等, 使肌细胞表面或肌细胞间血管表面的游离神经末梢受到刺激, 或这种状态下肌细胞代谢障碍产生某种化学物质刺激了神经末梢, 从而引起疼痛的传导^[1]。进而, 肌肉反射性地出现僵硬, 使活动受限。线粒体损伤, ATP 功能障碍, 使肌肉收缩无力。

悦肌灵搽剂可显著抑制或恢复上述骨骼肌超微结构的损伤性变化, 从而解除肌肉疼痛。这种作用可能与该药增强局部血液循环, 有利于损伤肌细胞的代谢调节与修复有关。

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Abstract of Original Articles

Clinical study on epiphyseal injury treated by integration of traditional Chinese and modern medicine

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A new classification of epiphyseal injury was suggested through clinical and X-ray analysis of nine positions in epiphyseal injury on extremities in 363 cases, in the meanwhile pathogenesis of epiphyseal injury, morphology, classification, treatment and prognosis etc. problems were clarified. A preliminary exploration of therapeutic theoretical basis and principles were made via a remote observation of 216 cases, the rate of therapeutic excellent and good with maneuver reduction and splint fixation was 91.1%. It was prominently superior than open reduction of which the efficacy was 71.9%. Integration of traditional Chinese and modern medicinal therapy fits to various age, position and kinds of most epiphyseal injuries.

Key words Epiphysis Trauma and injury

Integration of traditional Chinese and modern medicinal therapy

(Original article on page 5)

Multinuclear giant cells and osteoclasts in callus - histological and ultrastructural observation

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The morphology of multinuclear giant cells (MGC) and osteoclasts (Oc) in rabbit's radius callus had been observed by light microscopy and transmission electron microscopy. It showed that both MGC and Oc participated in bone resorption, but MGC mainly resorbed dead bone and bone chips through phagocytosis and extracellular degradation at the early stage of fracture healing, and Oc mostly resorbed calcified cartilaginous callus and new formed trabecular bone by extracellular resorption to accomplish the remodeling of callus. It is suggested that the filopods on the surface of MGC and ruffled border on the surface of Oc are closely related to extracellular degradation of bone mineral. Their difference in the mechanism of degradation is waiting or further study.

Key words Callus Histology Ultrastructure

(Original article on page 8)

Influence of ultrastructure of rabbit skeletal muscle mimic mountain-climbing myalgia treated with Yue Ji Ling lotion

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Exploration of the pathology of mountain-climbing myalgia and observation of therapeutic action of Yue Ji Ling Lotion on rabbit with over burden motion mimic human mountain-climbing action were carried out. The results indicated that the functional state of rabbit extremities is similar to human mountain-climbing myalgia and the ultrastructure of skeletal muscle showed prominent traumatic changes. Yue Ji Ling lotion bears the function of inhibition the traumatic changes effectively and restoration the normal function of the limbs as well.

Key words Skeletal muscular system Yue Ji Ling lotion Ultrastructure
(Original article on page 10)

Dr. Shi Weizhi's experience in treating cervical spondylotic myelopathy

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Old traditional Chinese medical doctor Shi Weizhi holds that the pathogenesis of cervical spondylotic myelopathy is due to insufficiency of liver and kidney, emptiness of Du meridian, blockade of the meridian due to wind-dampness, obstruction of flowing of Qi and blood. Better results were obtained after application of the therapeutic principles of invigorating the liver and kidney, warming the meridian, invigorating of Qi and activating of blood circulation, and expelling of wind and dredging the meridian passage.

Key word Cervical spondylosis Pathogenesis
Traditional Chinese medicinal therapy
(Original article on page 12)

Study and clinical application on frame-style ladder form enhanced steel plate

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Based on the principle of bio-mechanics and starting point on the stability of internal fixation, double arm frame-style ladder form enhanced steel plate was designed. The therapeutic effect was satisfactory after 37 cases had been used clinically. No one case of break wire, pulling out wire and refracture phenomenon on the fractured end was found during withdrawing the steel plate.

Key words Fracture fixation Frame-style ladder form enhanced steel plate
(Original article on page 27)