

手法治疗实验性膝骨关节炎的血流动力学研究

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摘要 新西兰大白兔 18 只随机分为三组, A 组为对照组; B 组为手法治疗组; C 组为开窗治疗组。通过结扎股静脉及臀下静脉形成骨内高压模型, 在造模前后及取材前作骨内压测量, 在手法前后作彩色多普勒血流检测。结果显示: 结扎静脉能有效造成骨内持续高压, 手法能减轻骨内高压, 降低股动脉远端阻力指数, 增加收缩期峰值速度、平均流速及加速度, 改善了局部血流动力状况。

关键词 手法 膝关节 血流动力

自 1938 年 Larsen^[1] 首先提出骨内压 (IOP) 概念以来, 许多实验研究表明骨内高压在骨性关节炎 (OA) 发病中起了重要作用。通过骨内压测定能够预测和发现放射学前期甚至临床前期的骨内病变^[2]。彩色多普勒血流显像 (CDFI) 在灰阶 B 超显示血管解剖结构的基础上能提供血流的信息, IOP 及 CDFI 结合能较好地反映膝关节局部的血流动力状况。本实验从 IOP 及 CDFI 变化来观察手法对实验性 OA 的治疗作用。并探讨其作用机理, 为临床治疗膝 OA 提供实验依据。

材料与方 法

1. 动物及分组: 新西兰纯种大白兔 18 只, 均为 5 月龄雌性兔, 体重 2.7~3.2kg。随机分为 A、B、C 三组, 每组 6 只。A 组为对照组; B 组为手法治疗组; C 组为开窗治疗组。

2. 造模原理及方法: 手术造成右下肢骨内高压形成兔右膝骨关节炎。戊巴比妥钠针 (30mg/kg) 兔耳缘静脉内麻醉。仰卧位固定于手术台上, 两髌关节外展稍屈曲, 双膝关节屈曲 30° 于右腹股沟处作 1cm 纵切口分离出股静脉, 紧靠腹股沟韧带处作双重结扎, 并于结扎线间切断。松开下肢, 于右臀部髌关节后外侧做小切口, 分离出髌内静脉的属支臀下静脉, 同样行双重结扎, 结扎线间切断。缝合皮下各层及皮肤。所有动物照常运动、负重, 单笼饲养。

3. 治疗: 治疗在造模后 6 周进行, 共治疗

6 周。(1) 对照组: 不作治疗, 仅以普通饲料喂养。(2) 手法组: 点揉膝周, 每处 50 次; 屈伸膝关节 10 次; 逆、顺抱推右后肢各 10 次; 大腿中上段坐骨神经部位点按一分钟; 屈髌屈膝位按压腹股沟股动脉处, 阻断血流 20 秒, 然后伸膝松压, 共重复 5 次。手法每天 1 次, 每周 5 次, 由专人操作。(3) 开窗组: 在静脉麻醉下于股骨内髌上方约 0.5cm 和胫骨结节内侧切开皮肤及各层组织, 剥离骨膜, 用摇钻钻一直径为 4mm 骨孔达骨髓腔, 创面骨蜡止血。

4. 检测: (1) IOP: 使用 SY-II 型智能生理压力测试仪, 16 号带芯穿刺针。所有动物在造模前及术后 12 周在静脉麻醉下双下肢外展 15°、膝关节屈曲 30° 位作双侧膝旁骨内压测定, 右下肢保留穿刺针, 在结扎右股静脉后再作骨内压测定。具体测量部位为股骨内髌上方约 0.5cm 处及胫骨结节内侧, 穿刺针穿通骨皮质达髓腔后, 抽出针芯注入 2500u% 肝素生理盐水约 0.5ml, 连接三通阀, 调整仪器进行测压, 待其测值平稳后记录其数值。C 组动物在开窗减压前再进行一次骨内压测量。取材前同时作双侧膝关节内压测量, 测量方法除测压针为刺入关节腔内和导压管内充盈的为气体外, 其它与骨内压测量基本相同。(2) CDFI: 使用 Biosound-AU-4000 型彩超仪, 选用探头频率为 13MHz, 彩色频率为 7.5MHz。增益调至最大灵敏度而不产生噪音, 脉冲重复频率设置

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在 500~1000Hz。帧频置于低水平。壁滤波置于 50Hz。脉冲 Doppler 取样容积的大小视血管而定,通常为 1.5~3mm。B 组兔造模 10 周后,将兔仰卧捆绑在固定板上,大腿前内侧行剃毛处理,屈髋、外展各 15°,充分暴露被检区。首先用 CDFI 从腹股沟到膝上作纵横扫查,当探及股动静脉时,仔细调整声束至与血管平行,在膝关节上 3~4cm 的股动脉处作脉冲 Doppler 频谱检测。在血流检测完毕后,再作股动脉的内径测量。检测后作手法治疗,具体操作同前。手法后 10 分钟再重复检测。指标有:收缩期峰值速度 (PSV)、舒张末期流速 (EDV)、平均流速 (MV)、加速度 (ACC)、阻力指数 (RI)、搏动指数 (PI)、股动脉直径 (D)、心率 (HR)。

结 果

1. 造模前后右膝旁骨内压测值明显增高,有非常显著意义 ($P < 0.01$),见表 1。

2. 患侧膝旁骨内压造模后与治疗后比较,A 组无显著差异,B、C 二组均有显著意义,C 组动物开窗前与取材前比较亦有显著差异。见表 2。

3. 关节内压测量具有极大的个体差异 ($-1.0\text{Kpa} \sim 1.0\text{Kpa}$),变异系数均较大。

4. 健侧和患侧 CDFI 作配对比较,除心率外其它各项指标均有显著或非常显著差异,其具体测值见表 3。

5. 患侧手法前后 CDFI 各指标均有显著或非常显著差异,其具体测值及其 T、P 值见表 4。

表 1 造模前膝旁骨内压测值及术后右膝旁骨内压测值(N=18)

	结扎股静脉前	结扎股静脉后	P 值
LT	2.27±0.63		
LF	2.32±0.67		
RT	2.14±0.58	3.69±1.12	<0.01
RF	2.23±0.51	3.75±0.95	<0.01

注:单位:Kpa;LT:左胫骨上端;LF:左股骨下端;RT:右胫骨上端;RF:右股骨下端。

表 2 各组动物治疗前后右膝周骨内压测值变化(X±SD)

	造模前	造模后	开窗前	治疗后
A RT	2.15±0.67	3.52±1.43		3.08±0.63 ^{ns}
RF	2.16±0.53	3.63±1.22		3.15±0.71 ^{ns}
B RT	2.12±0.85	3.83±1.23		2.53±0.33 ^a
RF	2.45±0.45	4.22±0.83		2.60±0.49 ^b
C RT	2.28±0.38	3.80±0.94	3.21±0.70	2.57±0.48 ^{ad}
RF	2.18±0.48	3.60±0.96	3.03±0.69	2.30±0.47 ^{ac}

注:上标字母表示:ns $P > 0.05$ 与造模后对照比较,a $P < 0.05$ 与造模后对照比较,b $P < 0.01$ 与造模后对照比较,c $P < 0.05$ 与开窗前对照比较,d $P > 0.01$ 与开窗前对照比较。

表 3 兔健侧和患侧各具体测值

指标	健侧(SD±X)	患侧(SD±X)	T 值	P 值
PSV(cm/s)	59.40±5.07	48.58±4.56	10.06	<0.01
EDV(cm/s)	18.57±2.64	12.04±1.67	11.62	<0.01
ACC(cm/s ²)	18.76±6.53	13.76±2.76	2.85	<0.05
RI	0.70±0.00	0.76±0.05	3.16	<0.05
PI	1.78±0.07	2.18±0.11	14.45	<0.01
MV(cm/s)	0.27±0.04	0.20±0.03	15.51	<0.01
D(mm)	1.65±0.24	1.30±0.05	4.15	<0.01
HR(b/m)	254.17±16.06	252.17±18.97	1.18	NS

表 4 患侧手法前后各测值及其 T、P 值

指标	手法前(SD±X)	手法后(SD±X)	T 值	P 值
PSV(cm/s)	48.58±4.56	61.35±6.69	8.75	<0.01
EDV(cm/s)	12.04±1.67	14.21±2.01	6.31	<0.01
ACC(cm/s ²)	13.76±2.76	26.02±4.33	6.27	<0.01
RI	0.76±0.05	0.7±0.06	3.10	<0.05
PI	2.18±0.11	2.4±0.20	1.08	<0.05
MV(cm/s)	0.20±0.03	0.24±0.04	5.70	<0.01
D(mm)	1.30±0.05	1.65±0.24	4.41	<0.01
HR(b/m)	252.17±18.97	258.5±22.17	3.34	<0.05

讨 论

1. 本实验的手法治疗是以已故著名中医魏指薪先生的伤科手法^[3]并借助于 IOP 及 CDFI 检测血流动力学指标, 观察手法的治疗作用。

实验采用结扎股静脉及臀下静脉, 阻断下肢大部分静脉回流, 同时又保留了股深静脉向髂外静脉回流这一通路, 防止肢体过度肿胀及坏死。其膝关节结构发生类似临床上早期骨关节炎的改变^[4]。本实验在股静脉结扎后可引起胫骨上端和股骨下端骨内压同步大幅度上升, 平均升高值右胫骨上端为 $1.68 \pm 0.95 \text{Kpa}$, 右股骨下端为 $1.60 \pm 0.58 \text{Kpa}$, 结扎前后骨内压具有非常显著的差异 ($P < 0.01$)。对开窗组动物在开窗前(即造模 6 周后)作骨内压测定, 发现其稍低于股动脉结扎后的骨内压, 但仍高于股动脉结扎前的骨内压 ($P < 0.01$), 说明本方法能有效地造成骨内持续高压。

对照组右膝旁骨内压较高, 取材前与造模后比较无显著差异 ($P > 0.05$), 表明骨内高压持续存在。手法组、开窗组各组治疗后与造模后的比较, 骨内压下降明显, 均有显著意义 ($P < 0.01$), 其下降值比较以开窗组为最明显, 说明采用直接在骨皮质开窗减压较彻底。

2. 在血流检测中各测值的变异系数较小, 说明重复性好, 具有较好的诊断价值。实验性膝 OA 兔动脉的 PSV、EDV、MV、和 ACC 明显减低, RI、PI 增高, 这种改变是由骨内静脉瘀滞所致的骨内压力增高引起。Taylor 等在颅内血流的研究中也表明 RI 的增高与脑动脉灌

注压的增高有很好的相关性^[5], 我们与 Taylor 等的研究结果均说明 RI 是反映远端阻力增加的一个敏感指标。PSV、EDV 和 ACC 的变化与 RI 一样, 也与远端阻力的变化有关。患肢经手法治疗后 PSV、EDV、ACC、MV、HR 明显增高, D 增大, RI 明显降低, PI 无明显变化。说明手法不能明显地改变血管的性质, 但能加快各期血流速度, 提高加速度, 增大股动脉直径, 降低远端血管阻力, 提高了单位时间内通过血管的血流量, 为组织的代谢提供足够的营养和氧气, 并清除有害的代谢产物。故手法治疗的机理可能是手法通过皮外的挤压而产生对血管的挤压, 促进了血液的流动; 同时由于手法的作用提高了肢体的温度, 改变血液流变学性质, 降低全血粘滞性, 有利于血液的流动, 这一点在本实验同时所作的血液流变学检测中已被证实。

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(收稿: 1996—06—26)

1998 年《中医杂志》征订启事

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《中医杂志》1998 年每册 4.00 元, 全国各地邮局办理订阅, 邮发代号: 2—698

地址: 北京东直门内北新仓 18 号, 邮编: 100700。

Abstract of original Articles

Extradiscal Injection of Collagenase in The Treatment of Herniated Lumbar Disc—A Therapeutic Analysis of 240 Cases

Zhang Guomin, Wang Zhimin, Li Wenxian, et al.

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263 cases of lumbar disc herniation were treated with extradiscal injection of collagenase. All patients with typical clinical symptoms and signs were diagnosed by CT scanning or MRI, and all of them without therapeutic effect with conservative therapy. Among them, 240 cases had been followed up clinically for 3—12 months. The results showed that the cure rate, effective rate and ineffective rate were 62%, 92% and 8%, respectively. The theoretical foundation of extradiscal injection of collagenase was expounded that collagenase could dissolve the herniation of lumbar disc but did not affect to adjacent structures. The mechanisms of pain response after discolysis were analysed. The writers thought that the therapeutic effect of discolysis is closely related to the choice of the indication, the accuracy of the injection site, and the dosage of collagenase. Extradiscal discolysis is a safe, convenient and efficient method for treating herniated lumbar disc.

Key words Collagenase Discolysis Protrusion of inter vertebral disc Extradisc

(Original article on page 3)

The Comparative Study of Various Therapeutic Methods for Femoral Head Necrosis in Children

Wag Kunzheng, Li Zhiying, Yu Quansheng, et al.

The Second Affiliated Hospital, Xi'an Medical University, Xi'an (710004)

215 cases of femoral head necrosis in children were treated with non — operative therapy, drilling decompression, synovectomy of hip joint, fenestration decompression and cancellous bone grafting, transplation of satorius muscle — bone flap, and trans — plation of anastomotic blood vessel — fibula, respectively. Among them, 161 cases were followed up for 1—15 years and

systematically observed. According to Catterall's X—ray stages, and taking the function of hip joint and the changes of femoral head in X—ray film as the criteria of evaluation, the indication of various therapeutic methods in different stages were observed.

Key words Children Necrosis of femoral head Treatment

(Original article on page 7)

Effects of Qianlinghuo Heji on Osteoporosis Induced by Ovariectomy: An Experimental Study

Tao Youlue, Fang Liang, Zhang Zhian, et al.

The Second People's Hospital of Fujian Province, Fuzhou (350003)

Qianlinghuo Heji (Epemedium Leptorrhizum Agent) is a mixture of Chinese medical herbs on osteoporosis. The rats' models of postmenopausal high turnover osteoporosis were established three months after ovariectomy, and then divided into three groups: the Chinese drug group, nilestriol group, and model group. After treating for three months, the results showed that the ration of fasting urine calcium/urine creatinin and urine hydroxyproline/urine creatinin in Chinese druy group and in nilestriol group are obviously decreased than that in model group ($P < 0.05$ and < 0.01 , respectively); the serum estradiol, bone mineral capacity and bone mineral density in both the Chinese drug and nilestriol groups are increased than that in model group; the level of serum bone gal protein in Chinese drug group is higher than that in nilestriol and model groups ($P < 0.05$); and the activity of serum alkaline phosphatase in nilestriol group is lower than that in Chinese drug and model groups ($P < 0.05$). The results indicated that Qianlinghuo Heji can prevent the rats with osteoporosis from losing bone material and thus protect the bone.

Key words Osteoporosis Chinese drug Qianlinghuo Heji Rat Ovariectomy

(Original article on page 9)

Hemodynamic Study of Manipulative Treatment of The Experimental Osteoarthritis of Knee Joint

Wang Jiwei, Shi Weibin, Du Ning, et al.

Zhejiang Lishui City Hospital (323000)

18 New Zealand white rabbits were divided randomly into three groups, i. e. group of manipulative treatment, group of fenestration treatment, and the control. Models of intra — osseous high pressure were established by ligating the femoral and inferior gluteal veins. The intraosseous pressure was determined before and after modelling and before specimen was taken, and color Doppler bloodflow detection was made before and after manipulation. The results showed that persistent intraosseous high pressure could efficiently produced by ligation of veins, and the manipulation could decrease the intraosseous high pressure, the resistance index of the distal end of the femoral artery, but increase the systolic peak velocity, the mean velocity and acceleration of blood flow, thus the local hemodynamic condition was improved.

Key words Manipulation Knee joint Hemodynamics

(Original article on page 13)

The Primary Repair of Traumatic Skin Defect in Multiple Fingers Treated with Pedicle Skin Flaps of Opposite Upper Arm

Tang Yaquan.

The Affiliated Hospital of Anhui Chinese Medical College, Hefei (230031)

32 cases (69 fingers) of traumatic skin defect in multiple fingers with exposed arteries, nerves, tendons, bones or joints had been treated by using the pedicle skin flaps of the opposite upper arm from 1983 to 1994. Among 32 cases, the incised wound was happened in 8 cases, the avulsed wound in 10 cases, and the lacerated wound in 14 cases; two fingers were wounded in 27 cases and three fingers in 5 cases. All of them were emergent cases and the pedicle skin flaps were all alive. Thus the writer considered that this method may be used in emergent case. The earliest time for cutting the pedicle of skin flap was discussed.

Key words Pedicle skin flap Multiple fingers Skin defect

(Original article on page 16)

The Treatment of Fracture of Thoracolumbar

Spine with Paraplegia by Anterior Decompression and Internal Fixation

Yan Hong, Nong Shaoyou, Xiang Xiangheng, et al.

Shenzhen City Red Cross Society Hospital (518029)

21 cases of fracture of thoracolumbar spine with injury of spinal cord or cauda equina had been treated by anterolateral decompression and Kaneda's internal fixation from 1993 to 1996. The results showed that, in addition to 2 cases without change at injury grade A, 19 cases had been improved in the range of 1—3 grades. It is considered that the operation in anterior route can clear away the compressive material under direct vision, and thus the sufficient decompression can be obtained and the integrity of posterior column can not be destroyed. As to the bursting fracture of double vertebral body, the administration of anterior decompression and Kaneda's internal fixation can also obtain a good therapeutic effect.

Key words Anterior decompression Internal fixation Fracture Paraplegia

(Original article on page 20)

Correction of Angular Deformity at Fracture of Tibia and Fibula by Wedging of Cast (A Report of 50 Cases)

Chen Jialu, Wang Zhilin, Tao Haiying, et al.

The First Affiliated Hospital, Hubei Medical University, Wuhan (430060)

520 cases of unstable fracture of tibia and fibula had been treated in our hospital during last 5 years. The most of them were healed by closed reduction. Through treatment we found that about 10% patients with fracture of tibia and fibula had angular deformities in various degrees after of cast. The traditional method the wedging of cast was used to correct the angular deformities in 50 cases. The result showed that the angular deformities were corrected better, the redisplacements were prevented, and the satisfactory functions were obtained.

Key words Fracture of tibia and fibula Angular deformity Correction of wedging

(Original article on page 25)