

实验研究

电效应对骨重建影响的临床观察和动物实验研究

河北省科学院(石家庄 050081) 顾志华 张印玺* 张蒲 郑顺山**

摘要· 电效应对骨重建影响的机理目前尚有不同解释,我们为了解电效应对骨重建影响,观察了磁场对骨愈合的影响及电流对骨重建的实验研究。通过临床观察和动物实验说明,电效应确能影响骨的重建,并对愈合有促进作用。

关键词 电效应 骨 骨重建

为从骨电生理观点探讨骨愈合及骨的功能适应性机理,我们开展了电效应对骨重建影响的实验,除观察了磁场效应对骨愈合影响外,还进行了电流对骨重建影响的实验研究。

磁场对骨愈合影响的临床观察

1. 实验依据 若把一对平行线圈置于骨折端两侧,并通过一定频率的交流电流(一般频率取 2~100HZ),则在线圈间产生几个高斯的弱磁场 B。由于该磁场作用,则在骨折处沿长轴方向产生感应电流,其磁场变化率为: $\frac{dB}{dt} = 55.1 \times V$ 。其中, V 为输出电压。在局部电压降为 1~10V.cm⁻¹时,有促进骨骺板形成及骨折修复作用。

此外,磁场可降低末梢神经的兴奋性,消除对神经末梢的机械压迫,加速炎症渗出物的消散,并具有扩张血管、加快血液循环作用,加速供应成骨所需的氧和其它物质。

2. 临床资料 自 1993 年 2 月~8 月采用 DS-1 型磁场式骨折愈合机进行临床观察。本组共观察 45 个病例,其中治疗组 30 例,男 17 例,女 13;对照组 15 例,男 10 例,女 5 例。横断型骨折 19 例,斜形骨折 11 例,粉碎型骨折 10 例,陈旧性骨折术后 5 例。

3. 治疗方法 实验组中有 7 人行手术切开内固定术,对照组有 2 人行内固定;其余均为收入院后行骨牵引,手法复位,小夹板固定。采用骨折愈合机治疗,并使用同样的磁场强度、波型、频率和时间(每次 120 分钟)。治疗结果如

表 1 所示。

表 1

	骨折类型				治疗次数	住院天数
	横断	斜形	粉碎	术后		
实验组	13	7	7	3	42.2	46.9
对照组	6	4	3	2	50.9	57.1
合计	19	11	10	5		

从该表可看到:实验组平均治疗次数为 42.2 次,对照组为 50.9 次,少 8.7 次;住院天数实验组为 46.9 天,对照组为 57.1 天,少 10.2 天。由此可见,磁场对股骨干骨折治疗有较明显促进作用。

电极对骨重建影响实验

通过动物实验,观察电流对骨重建的影响,我们采用的是恒压、低强度直流电。电流强度可以是不随时间改变的平稳直流,也可以是随时间改变的疏密波或脉冲电流。把交流电源通过全波整流、滤波、变压、稳压等处理后而组成应用装置。

这个实验我们开展时间短,只做了 6 只动物,且每只动物采用了不同给电时间、不同电流强度。虽然如此,也可观察到电流对骨重建有着明显影响。但由于数量还少,观察指标较多,尚难做统计学处理。

* 河北省保定市第二医院
** 河北省中医院

讨 论

1. 由临床观察和动物实验研究说明,电效应确能影响骨的重建,并对愈合有促进作用。由此推论,骨对力环境的反馈和愈合机理应与骨电生理有关。

2. 实验支持在骨折治疗过程中,进行有选择、有节制的功能锻炼观点。从骨电性质观点看,功能活动可使骨折端获得间断性生理应力,由于骨的力电效应,骨折段将产生流动电势;同时,功能活动可提高局部体温,由骨的热电效应,出现极化电荷,它是压电效应的次极效应。所以,适时、适度的功能锻炼,有助于加速骨断面愈合。当然,功能锻炼对促进血循环,防止肌肉萎缩、软组织粘连等也有明显作用。

3. 本实验还支持在骨折治疗过程中要求

没有功能替代观点。我们知道,骨折治疗阶段主要是骨桥搭建及塑型修复阶段,它是在一个开放的反馈系统中按着功能需要进行的所谓“继发性长周期功能适应”修复。环境的特征将做为一种信息输入反馈系统,从而调整骨折端修复。因此,固定应服从修复的需要。

一个良好固定应既具有几何上的稳定性,又较少干扰骨应承担的力学状态。一个几何上十分稳定的坚强固定,如果对骨的受力状态有很大干扰,甚至全部功能替代不能认为是好的固定,因此时骨折端不能获得如上述实验提到的电效应。所以,本实验支持骨折治疗的“弹性固定准则”理论中提出的“非功能替代”观点。

(收稿:1995-01-24)

开放性骨折内固定术后合并局部破伤风治疗体会

辽宁省新民市人民医院(110300)孙德敬 马 岩 史广民

我科于 1989~1994 年治疗开放性骨折术后合并局部破伤风 3 例,报告如下。

典型病例

×××,男 30 岁,1989 年 9 月 15 日,因右股骨干中段开放性粉碎性骨折入院。股骨干后侧有一长 5cm 之蝶形骨缺损,伤口在大腿中段内侧长约 3cm。门诊予以清创缝合,注射抗破伤风血清 1500 单位后收入院。伤后第 2 天,在硬膜外阻滞麻醉下行髓内 V 形针内固定术,术后骨折对位对线良好。伤后第 8 天,伤肢出现阵发性痉挛性抽搐,稍有刺激即可诱发,每次约持续 3~5 分钟,患肢短缩 5cm,骨折处向前成角畸形,摄 X 光片发现髓内针尾端已自粗隆处退出 10cm,达第一腰椎横突处皮下,骨折远端嵌插近端髓腔 4cm。结合病史及体征疑似局部破伤风,遂做股内侧伤口深部穿刺并涂片,发现革兰染色阳性杆菌,确立诊断。于是,每日静脉点滴青霉素钠 800 万单位,抗破伤风血清 1 万单位、甲硝唑 0.5g,并肌肉注射安定 10mg/tid 以控制抽搐。在伤后第 15 天,硬膜外麻醉后透视下行手法复位,将髓内针自尾端再次击入 7~8cm,并行单髓人字石膏外固

定,但因抽搐尚未得到控制而再发短缩成角畸形。再经上述药物治疗了 3 周,抽搐完全停止。于伤后第 35 天再次手术,拔出髓内针,改用加压钢板内固定,断端骨缺损处以松质骨片填充。第二次切开复位术后 9 周去石膏托,行功能练习。6 个月后复查,骨折愈合良好,屈髋正常,屈膝 90°。

讨 论

局部破伤风是一种轻型破伤风。其发生机制为破伤风杆菌产生的内毒素,直接作用于局部神经肌肉终板易感细胞,引起局部肌肉紧张性收缩状态。本组病人伤后虽曾注射抗破伤风血清 1500 单位,然而由于门诊清创不彻底,加之抗体产生不良,患肢内仍有痉挛毒素存在,以致引起局部破伤风的发生。

本组病人为不稳定性骨折,骨折整复固定后,由于局部破伤风的发作,下肢肌群阵发性强直性痉挛性抽搐,引起骨折再次移位和髓内针退出。故在抽搐未完全控制时,企图将骨折复位是徒劳的。

(收稿:1994-12-12)

English Abstract

Radiographic findings of derangement of atlanto-axial joint

Institute of Orthopaedics and Traumatology, China Academy of TCM(100700)

Based on the radiographic study and analysis of atlanto-axial joint of normal and abnormal, we consider that the derangement of atlanto-axial joint can be diagnosed as: the difference of bilateral distance between the dens and the lateral mass is larger than 1mm, the difference of central sagittal line of dens and atlas is larger than 1mm; there is an abnormal movement of atlanto-axial joint on the X-ray film of open mouth with 15° rotation; and the patient bears the symptoms and signs of cervical spondylosis.

Key words Atlanto-axial joint Derangement of atlanto-axial joint X-ray film

(original article page 3)

Tension band and circular fixation in treating patellar fracture

Second Affiliated Hospital Of Xian University of Medical Science(710004)

Sixty five cases of fracture of patella were treated with tension band, circular fixation with stainless steel and circular fixation with silk thread, the average rate of excellent and good being 91.52%. In the excellent group, the tension band group was 80%, and the stainless steel and silk thread group being 56% and 56.5% respectively. Due to internal fixation with tension band do not need external fixation with plaster of paris, so it facilitates early knee joint exercise and rehabilitation. The therapeutic efficacy is superior than the other two methods ($P < 0.05$). It requires accurate and fine manipulation during operation. As compared with stainless steel circular fixation, silk thread circular fixation bears the advantage of avoiding another operation for withdrawing of the wire, though their therapeutic effect was in similarity.

Key words Fracture of patella Internal fixation

(original article page 5)

Clinical observation and animal experimental study on influence of electric effect in

bone remodelling

Academy of Science, Hubei Province (050081)

There is different explanation for the mechanism of the influence of electric effect in bone remodelling. Experimental study was carried on in observation of magnetic field in the influence of bone healing and electric current in bone remodelling. Through clinical observation and animal experiment, it indicates that electric effect can influence bone remodelling and promote bone healing.

Key words Electric effect Bone Bone remodelling

(original article page 8)

Transplantation of medial head of gastrocnemius muscle in treating old injury of posterior cruciate ligament

Guangdong Hospital of TCM, Guangdong College of TCM(510120)

since 1991, five cases (2 moderate instability, 3 severe instability) of old traumatic posterior cruciate ligament injury were treated with medial 1/3 to 1/2 of medial head of gastrocnemius muscle of the same side. Marked improvement of function (walking, quick working, going upstairs and downstairs, no instability) was found postoperatively, except there was a little bit sensation of instability (during rapid turning round or rapid stopping).

Key words Disposition of gastrocnemius muscle posterior cruciate ligament Injury of knee surgical operation Joint ligament

(original article page 10)

Treatment of avulsion fracture of tibial spine Luoyang Railway Hospital, Hunan province(471002)

In this article, 8 cases with an average of 14 years of age suffering avulsion fracture of tibial spine were reported. they were classified into 3 types, two of them were treated with conservative therapy; 6 of them, internal fixation with steel wire. Bony healing nearly normal joint function and satisfactory results were found in

all of these 8 followup cases. Classification and method of operation were introduced. Advantage of the operation, early diagnosis and mechanism of injury were discussed.

Key words Tibia Fracture peration
(original article page 11)

Improved Stimson's method in treating hip joint dislocation

Second College of Medical Science, Xi'an University of Medical Science(710004)

Seventy four cases of traumatic posterior dislocation of hip joint were reported in this article. Satisfactory clinical results were obtained after treatment with self--designed modified stimson manore duction. Method of reduction was introduced in detail, advantage of it was discussed.

Key words Traumatic posterior dislocation of hip joint Modified stimson's method
(original article page 12)

Characteristics of protrusion of L5S1 intervertebral disc (An analysis of 86 cases with symptoms and signs, myelogram, MRI, CT scanning

and operative findings)

General Hospital of Railway Construction Corporation of China(100043)

Eighty six operated cases of protrusion of lumbar intervertebral disc were reported. Among them, 29 cases (33.72%) were L5S1 level, next to L4, 5. The results show that the lower back pain in L5S1 level is more severe; for Laseque's sign, L5S1 level being $39.66^{\circ} \pm 18.46^{\circ}$; L4, 5, $49.90^{\circ} \pm 21.37^{\circ}$ ($P < 0.0284$). water soluble myelogram, MRI and CT scanning bear better diagnostic action though there were no difference statistically. But each examination bear their own benefit. There was significant difference between type and degree of two intervertebral disc space ($P < 0.013$, $P < 0.012$) being found in the operation. Lateral or extreme lateral position were found more in cases in level L5S1. It is realized that myelogram is the first choice, MRI or CT scanning should be added in doubtful cases. Lateral recess and nerve root canal should be carefully explored during operation.

Key words Protrusion of lumbar intervertebral disc L5S1 level
(original article page 29)

Zhongguo Gushang
China Journal of Orthopaedics
and Traumatology
(Bimonthly)
Chief Editor: Shang Tian-yu
Editorial Board 18 Beixincang
Dongzhimen, Beijing China
Subscriptions:
Domestic Local Post Offices
Overseas China International
Book Trading Corporation
(P. O. Box 399, Beijing)

中 国 骨 伤

(双月刊)

主编 尚天裕

主办单位

中国中西医结合学会

中国中医研究院

承办单位

中国中医研究院骨伤科研究所

协办单位

凤阳门皇汉中医诊所

山西省介休市正骨专科医院

编辑出版者

中国骨伤杂志编辑部

地址:北京东直门北新仓18号

邮政编码:100700

发 行 者

国内总发行:北京报刊发行局

订 购 处:全国各地邮局

国外总发行:中国国际图书贸易

总公司(北京 399 信箱)

印刷装订者

北京黄作印刷厂

ISSN1003-0034 第9卷第2期 1996年3月25日出 本刊代号:国内82-393 国外BM-587 广告经营许可证:京东0094号

CN11-2483 Vol. 9N. 2 publication date, Mar 25, 1996

国内定价:全年24.00元 每期4.00元