

学术探讨

臂丛根性撕脱伤的功能数字表示法

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摘要 本文对臂丛根性撕脱伤(节前损伤),进行了手术前后的功能数字测定,作出了符合临床实际的系列化功能数字(包括百分数),此法对治疗效果的评定和伤残病人的鉴定都是一种定量测评的方法,比单纯文字叙述要规范、客观、明了。

关键词 臂丛神经 节前损伤 功能数字

我们在数字表示上肢功能法^[1]基础上,对臂丛根性撕脱伤(节前损伤)患者试行功能数字测定,以期对治疗效果评价和伤残鉴定,提供一种定量测评方法。

研究对象

1988年7月~1994年6月,经确诊的臂丛根性撕脱伤共48例,男25例,女23例,左27例,右21例;年龄3~48岁。其中收住院行神经移位术者21例,术后不同时期(3个月至5年,平均1年10个月)获随访者19例。未经我们手术者27例,这部分病例,为我们术前的检查及功能数字测定,起了重要作用。手术的病例,尤其是获得复查的病例,是治疗前后功能数字变化,对比以及得到一系列百分数的研究对象。

感觉异常的功能数字测定

据人体表面积的测定^[2],从九分法可知双侧上肢的面积占全身表面积的18%(双上臂7%,双前臂6%,双手5%),则单侧上肢为9%,而从手掌法知,一个手掌的面积占全身表面积的1%。现设下列字母的含义分别为:W为单上肢感觉功能异常的数;a为环指末端至远侧腕横纹垂直距离的cm数;b为拇指内收内旋位时,其指间关节横纹桡侧缘至小指指横纹尺侧缘距离的cm数;c为一个手掌的面积cm²数,则c=a·b;x为单上肢某部位感觉异常的cm²数。据检测,可建立以下公式: $W = \frac{15x}{c}$ 常数15是我们测量所确定的。因感觉障碍的程度不同,依轻重可分为感觉消失,感觉减低,感觉过敏三种,分别以W⁰、W¹、W²表示。现确定:W⁰=1.2W W¹=1.1W W²=0.7W 三式分别运算后,出现在小数点后的数,4舍5入化为整数,即为感觉异常不同程度的功能数。

臂丛根性撕脱伤的功能数字

1. 全臂丛根性撕脱伤的功能数字:已知1单上肢表面积为全身的9%,一个手掌面积为1%。设:V为单上肢表面积的cm²数 则:V=9c 实际上全臂丛根

性撕脱伤病人,因上臂上方内侧是胸₂支配的,所以残留一个感觉存在的小面积cm²数,设它为P,这时x=v-p=9ab-p 则: $W = \frac{15x}{c} = \frac{15(9ab-p)}{ab}$ 现举例1,男18岁,诊断:左全臂丛根性撕脱伤(C₅₋₈及T₁)受伤时间为20个月20天测知:a=16.5cm b=9.1cm P=15cm² 则C=150 $W = \frac{15(9ab-p)}{ab} = 133W^0 = 1.2W = 160$

全臂丛根性撕脱伤后,运动功能全部丧失,设:Y为单上肢现存留的运动功能数,此时:Y=0 再设:Q为单上肢现存留的功能数。依运动功能数减去感觉功能障碍数等于现存留功能数原则^[1],则:Q=Y-W=Y-W⁰=0-160=-160 只要出现负数,即为重度功能障碍,全臂丛根性撕脱伤后的功能永远是负数。

该例行神经移位术(膈N—肌皮N,颈丛N运动支—腋N,副N—桡N,肋间N运动支—正中N内侧头)后,11个月复查结果:肩外展功能数为30,肘关节屈曲80,腕屈伸40,前臂旋转60;感觉功能除手部未恢复外,上臂及前臂外侧半皮肤面积有了感觉功能,据九分法知单上臂面积为3.5ab,单前臂为3ab,单手2.5ab。所以例1手术后仍遗留感觉异常的cm²数即x(术后)= $\frac{3.5ab}{2} + \frac{3ab}{2} + 25ab = 5.75ab$ $W_{(术后)} = \frac{15x_{(术后)}}{ab} = 86$ $Y_{(术后)} = 30 + 80 + 40 + 60 = 210$ $Q_{(术后)} = 210 - 86 = 124$ 这就是说例1在术后11个月复查时,运动功能数为210,而总功能数恢复到124,后者比前者数小的原因是仍有感觉异常(数字为86)的缘故。

2. 上臂丛根性撕脱伤的功能数字:上臂丛神经根(C₅₋₇)受伤后^[3],腋神经,肌皮神经,肩胛上、下神经,肩胛背神经发生麻痹,桡神经与正中神经发生部分麻痹,因此,下述肌肉如三角肌、肱二头肌、肱肌、肩胛下肌、大圆肌、冈上下肌、胸大肌锁骨头、桡侧腕屈肌、旋前圆肌、肱桡肌、旋后肌出现瘫痪。上述神经支

配的某些肌肉如背阔肌、伸指总肌有部分瘫痪现象。临床表现为肩关节不能外展上举，肘关节不能屈曲而能伸，前臂旋转有障碍，腕关节屈伸但肌力减弱，手指活动尚属正常。上肢伸面感觉大部缺失，拇指感觉有减退，2~5 手指，手部及前臂内侧感觉完全正常。

上述症状与臂丛上干 (C₅₋₆) 损伤类同，是否合并颈₇ 损伤，要检查背阔肌及伸指总肌有无麻痹。如有斜方肌萎缩，耸肩活动受限，以及肩胛提肌与菱形肌出现麻痹时，即表示上臂丛神经根在近椎间孔处断伤或撕脱伤。

例 2，女，22 岁，临床诊断为右上臂丛神经根性撕脱伤 (C₅₋₇) 3 个月。首先测算运动功能丧失的数字，设 u 为单上肢运动功能丧失的数字。检查测算的情况是：肩关节外展上举功能丧失数为 180，肘关节屈曲功能丧失 130，前臂旋转功能丧失 160，腕关节虽能屈伸，但肌力减弱，功能丧失 45。该患者由于合并颈₇ 损伤，背阔肌麻痹使肩关节后伸活动丧失 40，伸指总肌麻痹使 2~5 指的掌指关节伸直丧失 360。即 $u = 180 + 130 + 160 + 45 + 40 + 360 = 915$

其次测算感觉功能丧失的数 (W)。例 2 主要是上肢伸面的感觉缺失，占整个上肢表面积的一半，则此时： $P = \frac{v}{2}$ $x = v - p = v - \frac{v}{2} = \frac{9c}{2} - \frac{9c}{2} = 4.5ab$ 测例 2：a = 15.2cm b = 8.4cm 则：c = ab = 128 x = 4.5ab = 576 $w = \frac{15x}{c} = 68$ 设：Z 为单上肢的正常功能数即 Z = 3600 则：Y = Z - u = 3600 - 915 = 2685 Q = Y - W = 2617 所以说例 2 的功能数为 2617。再设：d 为现存留功能数为正常功能数的百分数 则 $d = \frac{Q}{Z} \times 100\% = 72.7\%$ 。就是说例 2 的现存留功能数是正常功能数的 72.7%。

该病人行神经移位 (膈 N—肌皮 N，颈丛 N 运动支—腋 N，副 N—肩胛上 N) 术后 10 个月复查情况：肩外展功能数测得 80，肩关节后伸 20，肘关节屈曲 100，前臂旋转活动 35，腕屈伸功能 70，2~4 指掌指关节都可伸直 45。上臂背侧仍有 4 × 6cm² 的感觉障碍区。所以： $u_{(术后)} = 100 + 20 + 30 + 125 + 20 + 180 = 475$
 $W_{(术后)} = \frac{15x}{c} = \frac{15 \times 24}{128} = 3$ $Y_{(术后)} = Z - u_{(术后)} = 3600 - 475 = 3125$ $Q_{(术后)} = Y_{(术后)} - W_{(术后)} = 3122$ 故例 2 术后 10 个月，功能数恢复到 3122。再设：H 为手术治疗后与治疗前功能数相比，所增进的百分数 则 $H = \frac{Q_{(术后)} - Q}{Q} \times 100\% = 19.3\%$ $d_{(术后)} = \frac{Q_{(术后)}}{Z} \times 100\% = 86.7\%$ 测算说明例 2 手术后 10 个月复查功能已恢复到正常功能的 86.7%。

3. 下臂丛根性撕脱伤的功能数字：下臂丛神经根 (C₈, T₁) 受伤后^[3]尺神经，前臂及臂内侧皮神经，正中神经内侧头出现麻痹，正中神经外侧头与桡神经出现部分麻痹，因此，下述肌肉如尺侧腕屈肌、1~5 指屈肌、大小鱼际肌群、全部蚓状肌与骨间肌出现瘫痪，而肱三头肌与指伸肌出现部分麻痹现象。

临床表现为手的功能丧失，手指不能屈伸，但掌指关节存在伸直动作，拇指不能掌侧外展。肩、肘、腕关节活动尚好。前臂及手部尺侧皮肤感觉缺失，臂内侧皮肤感觉亦可能缺失。

例 3，男，10 岁，临床诊断左下臂丛神经根性撕脱伤 (C₈, T₁) 3 个半月。根据临床表现测算其功能数字，皮肤感觉障碍的表现是前臂和手部尺侧半及臂内侧下部感觉缺失，可测知，患肢感觉存在的面积为单上肢面积的一半再加上臂内侧上部的正常部分 (P)，现测得例 3：a = 14cm b = 7cm p = 20cm² 这时： $x = \frac{v}{2} - p = \frac{9ab}{z} - p = 421$ 则 $W = \frac{15x}{ab} = 64$

运动功能检查情况：手的全部运动功能数 2680 丧失了，此时 u = 2680 由于肩、肘、腕的运动功能正常，则 Y = 920 Q = Y - W = 856 例 3 现存留的功能数为 856 根据 $d = \frac{Q}{Z} \times 100\% = 23.8\%$ 说明例 3 的现存功能为正常的 23.8%。

该例行神经移位术 (膈 N—正中 N 内侧头，副 N—尺 N) 后，9 个半月复查：W 由 64 减少到 32，由于拇指的屈伸功能有所恢复，u 由术前的 2680 减少到 2610 所以： $Y_{(术后)} = Z - u_{(术后)} = 3600 - 2610 = 1090$
 $Q_{(术后)} = Y_{(术后)} - W_{(术后)} = 1090 - 32 = 1068$ 即例 3 术后功能数字恢复到 1068 $H = \frac{Q_{(术后)} - Q}{Q} \times 100\% = 25.2\%$ 故例 3 手术治疗后与治疗前功能数相比，功能增进了 25.2% $d_{(术后)} = \frac{Q_{(术后)}}{Z} \times 100\% = \frac{1068}{3600} \times 100\% = 29.7\%$ 例 3 手术后 9 个半月复查功能恢复到正常的 29.7%。

讨 论

1. 关于感觉功能数字研究的有关问题

(1) 感觉异常 (W) 是所有感觉不正常 (W¹、W²、W³) 的混合存在形式。有时则需要进一步测算感觉障碍程度不同的功能数，这就用 W 分别乘以 1.2、1.1、0.7 顺次所得到的 W¹：表示感觉消失 (缺失、减退、无触痛) 的功能数；W²：表示感觉减低 (麻木、迟钝) 的功能数；W³：表示感觉过敏的功能数。感觉“存在”的说法，究竟是正常呢，还是其它，如有感觉，但不及正常。另外，感觉过敏和感觉减低实际上都是感

觉存在。臂丛损伤后，不管那一型，臂内侧上部一般都有一个感觉存在的小面积，因很小，从临床实际出发，我们将 P 代表感觉存在 cm² 数，未进一步测算存在的程度。

(2) 对于儿童，虽与成人有许多方面的差异，但都以手部 a、b 长度测量为依据，代表某部位感觉异常的 cm² 数 x 也会有相应比例的不同，所以公式 $W = \frac{15x}{c}$ 适用于所有年龄的人。

(3) 下臂丛根性撕脱伤后，出现 Horner 氏征，半个脸感觉功能异常（出汗障碍），根据九分法知，面部面积为全身的 3%，半个脸为 1.5%， $x_{(面部)} = 1.5ab$

$W_{(面部)} = \frac{15x_{(面部)}}{ab} = \frac{15 \times 1.5ab}{ab} = 22.5$ 因为这个感觉异常功能数是发生在面部，是人体另一个部位功能数减少的问题，不能与上肢功能数一起运算。

2. 关于耸肩运动的功能数字

臂丛根性撕脱伤，肩胛背神经及颈部其它神经（如副 N 及颈丛 N 运动支）也会受到损伤，此时斜方肌（副 N 和颈丛 N 运动支支配）、提肩胛肌和菱形肌（肩胛背 N 支配）发生麻痹；耸肩运动受障碍。主要上提肩

胛骨的肌肉斜方肌上部纤维，在上提过程中又使肩胛骨下角发生外旋（经测量 30°），而提肩胛肌和菱形肌在上提同时，还使肩胛骨下角内旋（30°），两者在提肩胛骨时互为协同，而对肩胛骨旋转中互为拮抗，因而产生肩胛骨上提运动^[4]形成耸肩活动。由此，我们初步确定耸肩运动的功能数字为 60，但这个数字不应包括在上肢功能数字中，而成为臂丛受伤后运动系统另一个减少了的功能数。关于肩胛胸壁活动的功能数字以及出现翼状肩后的功能数字，如何正确测算，都是以后需进一步研究的课题。

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利用胸锁乳突肌整复胸锁关节前下方脱位一例

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刘×，女，65 岁，农民。因跌伤右胸锁部十余分钟，于 1995 年 3 月 12 日来我院求治。自述跌倒时右肩部先着地，跌倒后右胸锁部肿痛，头部和右肩关节活动受限。查体：头倾向右前方，右肩下垂，右第一肋间隙胸骨旁局部隆起、有压痛、可触及锁骨内侧端。X 光片示：右胸锁关节向前下方脱位，右锁骨内侧端移位于第一肋间隙。

治疗 患者坐位，一助手握住右上臂上部向右牵引；另一助手双手绕过上胸部抱于腋下，向左作对抗牵引。约 3 分钟后，术者立于患者右前方，左拇指放于锁骨内侧端向上推，右手推患者下颌使头倾向左后方，利用右胸锁乳突肌牵拉锁骨内端使其到达第一肋上，之后，左拇指向上推同时向后压，右手继续推下颌使头倾向左后方，听到一响声，立即 X 光透视见胸锁关节已复位。用前“8”字绷带固定，绕 6 层绷带后，胸锁关节前方放一厚约 3cm 平垫，用胶布固定，再绕 4 层绷带，外用胶布加固。4 周后，于 4 月 10 日解除绷带、胶布，复拍 X 光片，示右胸锁关节已完全复位。但右肩关节

外展受限，嘱行右肩关节功能锻炼，患者还自找草药（不详）外敷，1 周后再复查，右肩关节功能活动已恢复正常。

讨论 胸锁关节前下方脱位，尤其锁骨内端已移位于第一肋间隙，单用拇指向上推，常产生一个向后的分力，使锁骨内端不易越过第一肋骨而复位。利用胸锁乳突肌锁骨头的牵拉，既可抵消拇指向上推产生的向后分力，还可增加向上方的复位力，使锁骨内端易于越过第一肋。当锁骨内端到达第一肋上之后，拇指向上推的同时向后压，并继续利用胸锁乳突肌的牵拉力，形成一个恰当的易于控制的向后分力，和向上的复位力。当锁骨内端到达原位时，这个向后的恰当分力。刚好能使锁骨内端向后复位，不致引起胸锁乳突肌过度牵拉而向上移位。胸锁关节前下方脱位后，前下方的韧带、肌腱均已撕裂，甚至离断。复位固定时加一厚平垫，可加强前方的压力，以防止半脱位发生。

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Abstract of Original Articles

Surgical treatment of the severe thoraco-lumbar burst fracture *Chen Fen-yong, Song Jian-rong, Lin Jia-jun, et al Union Hospital of Fujian Medical College (350001)*

The authors reported 51 cases of severe thoracolumbar burst fracture treated with surgery. According to Frankel grades, there were 13 cases of grade A, 7 cases of grade B, 14 cases of grade C, 5 cases of grade D and 2 cases of grade 3 in 11 cases, and total laminectomy decompression was done in 30 cases. The recovery rate was 73% in the incomplete paraplegia and 15.4% in complete paraplegia. It was concluded 1. Burst fractures mainly injure the middle column of the spinal cord, and spinal canal decompression as well as internal fixation should be done, if the fragments of vertebra had compressed about 1/3 of the spinal canal and the sagittal diameter of the later was less than 10 mm; 2. Internal fixation should be selected according to the condition and range of the injured vertebra, It is reasonable to choose the internal fixation procedure which can cause less injury of the spinal segment and get good results in reduction and fixation; 3. The recovery rate of the incomplete paraplegia group was significantly higher than that of the complete paraplegia group when surgical treatment was applied.

Key words Thoracolumbar vertebrae Burst fracture Surgical treatment

(Original article on page 3)

The following-up analysis on the patients with artificial hip-prosthesis *Zhai Ming-yu, Zhao Yu-gui, Wang Chun-ping, et al. Zhengzhou Hospital of Orthopaedics, Henan Province (450052)*

108 cases (112 hips), applied with artificial prosthesis have been followed up after operation, for the average years of 6.8. It was discovered that 37 cases of complication (about 33%) were produced due to the unproper operation; 46 cases of post-operational complication (41.1%); and the satisfactory therapeutic effective rate being about 74.1%.

The frequently encountered reasons and treatments of the various kinds of complications were put into stress

to be analysed and discussed in this paper.

KEY WORDS Artificial prosthesis Disease of the hip region

(Original article on page 5)

Study of the effect of intermittent compressive pressure to the osteoblasts in vitro. *Li Ke-xin, Shang Tian-yu, Dong Fu-hui, et al. Institute of Orthopaedics & Traumatology, Chinese Academy of TCM (100700)*

The experiment imitated the physiological changes of the cellular external circumstances, existed during skeletal functional movement, and supplied a intermittent compressive pressure (0.098 MPa, 15 minutes pressure, 15 minutes relax, 2 cycles/one hour, 8 hours/day) to the osteoblasts of experimental groups in vitro. It was discovered that the numbers of osteoblasts and the reaction of alkaline phosphatase in the experimental group were markedly elevated than that of the control groups. The results indicate that the intermittent compressive pressure is able to improve the proliferation and differentiation of the osteoblasts.

KEY WORDS Intermittent compressive pressure Osteoblast in vitro

(Original article on page 7)

Experimental research on the restoration of bone defect with the complex of heterogenous deproteinized bone and the bone morphogenetic protein. *Bai Meng-hai, Ge Bao-feng, Wang Yong, et al. Institute of Orthopaedics & Traumatology, Lanzhou General Hospital of the Military Region (730050)*

The failure of the implantation of the heterogenous deproteinized bone is always due to the intensive immune rejection. A new method for treating heterogenous bone was described in this paper. The bone of calf was deproteinized, i. e. extracted the main antigens and combined with bovine bone morphogenetic protein (BMMP) and then produced a kind of heterogenous deproteinized bone, not only without antigenicity, but also advantageous to the bone formation. Implanting this kinds of bone complex into the artificial defect (2cm) of the radius of Newzeland rabbit, the observation on the recovery with immunological, radioactive, and histological

methods, demonstrated that there was without any immune rejection in various kinds of experimental groups and there was indistinct margin between the implant and the fracture bed at 4th week; There were a great amount of lamella of new osteocytes and neogenetic vessels invasion into the implant, at the 8th week.

The experimental result indicates that the large heterogenous bone implantation, treated beforehand, can not only without any immune rejection, but also can achieve the expected restoration.

KEY WORDS Bone morphogenetic protein
Heterogenous bone implantation

(Original article on page 10)

Evaluation of the effect of ALQ on the experimental spinal cord injury, by means of evoked potential in the later.

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Three kinds of experimental model of spinal cord injury (light, severe and complete) had been imitated in sixty rabbits and part of them were treated by autohemotherapy of light quanta (ALQ). The effect of ALQ on paralysis was observed and reported, by means of spinal cord evoked potential (SCEP), a reliable electrophysiological index. The results demonstrated that the percentage of the recovery of SCEP in the incomplete spinal injury of the treated group, was higher than that in the control group. It indicates that ALQ can promote the functional recovery of the spinal cord from the damage.

KEY WORDS Spinal injuries Evoked potential
Autohemotherapy

(Original article on page 13)

Techniques of needle manipulation for the treatment of metacarpophalangeal joint dislocation *Ren Qi-uang, Gao Min. Department of Orthopedics, The First Affiliated Hospital, Anhui Medical University (Hefei 230022)*

The closed dislocation of the metacarpophalangeal joint is not common. The open-reduction is often needed to be done, owing to the speciality of its anatomical relationship. Here an experience of close reduction in

success with prying and plucking manipulation, applied with Kirschner needle on 30 cases was introduced in this paper. The mechanism and procedure of this method was demonstrated with anatomical data, diagrams and typical cases and its practical value was also discussed.

KEY WORDS Prying and plucking manipulation with Kirschner needle Dislocation of metacarpophalangeal joint.

(Original article on page 15)

The Treatment of teno-skin suture on 54 cases of mallet finger deformity *Li Liang-dong, Fang Ming-zhi, Shen Jun, et al. First Affiliated Hospital, Guiyang College of Traditional Chinese Medicine (550001)*

54 cases of fresh and old mallet finger deformity have been treated with the combination of the teno-skin suture and small splinter fixation and achieved satisfactory therapeutic effect. Analysis, according to the characteristics of the anatomy and mechanics of this kind of operation, indicated that this pattern of operation is the first choice for the middle and old aged patients.

KEY WORDS Mallet finger Small splinter fixation

(Original article on page 17)

The Demonstration of the functional digits of brachial plexus roots avulsion. *Pei Lian-kui, Liang Bing-sheng, Zhang Jian-zhong.*

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In 1993, we had reported the functional digits demonstrated at different parts of upper-limbs. Now we demonstrate the digits and percentages of function on the patients attacked with brachial plexus roots avulsion. The results indicate that the digital demonstration in the orthopaedics is an useful quantitative method to identify the injuries and curative effect on the patients and it is more standardized, objective and distinctive to evaluate the clinical curative effects.

KEY WORDS Functional digits Brachial roots avulsion Orthopaedics

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