无骨折脱位型颈脊髓损伤3种金属置入物疗效观察*

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Curative effect of cervical spinal cord injury without fracture or dislocation using three surgical methods

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Abstract

BACKGROUND: In recent years, the development of anatomy, imaging, surgical technology and the deepening understanding of studies significantly improve the treatment of cervical spinal cord injury without fracture or dislocation (CSCIWFD).

OBJECTIVE: To observe effect of anterior reconstruction of spinal stability, posterior decompression and lateral mass fixation, anterior decompression and posterior reconstruction of spinal stability for treatment of CSCIWFD.

METHODS: A total of 27 CSCIWFD patients from the General Hospital of Guangzhou Military Command between October 2003 and December 2005 were retrospectively analyzed, including 22 males and 5 females, who were admitted to hospital within 7 days after injury and treated by anterior decompression and reconstruction of spinal stability, single-door and posterior lateral mass fixation, anterior decompression and posterior reconstruction of spinal stability according to their damage. Treatment effect was evaluated by Frankel grading, and improvement rate was calculated by JOA score.

RESULTS AND CONCLUSION: All patients were followed up for 6 to 33 months, with an average of 18 months. Imaging results showed full decompression, well fixed internal fixation, no loosening or fracture phenomena. In addition, fusion segments were well after 1 year of bone fusion. The neurological symptoms of 27 patients were improved when they were discharged. Except one case of Frankel A with no significant recovery, the remainders were 1 to 4. Postoperative JOA score was significantly improved compared with the preoperative: the anterior decompression and reconstruction of spinal stability group was improved by 50%, posterior lateral mass of a single door and fixed group by 53%, anterior and posterior reconstruction of spinal stability by pressure group by 51%. All patients did not develop complications in blood vessels or nerve injury during implantation or follow-up. Results show that appropriate surgical procedure can obtain good effect according to features of CSCIWFD.

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摘要

背景：近年来，随着解剖学、影像学、外科技术的发展及国内外学者研究的深入，无骨折脱位型颈脊髓损伤的相关治疗取得了长足进步。

目的：观察前路重建脊柱稳定、后路减压+侧块固定、前路重建脊柱稳定+后路减压治疗无骨折脱位型颈脊髓损伤的效果。

方法：回顾性分析2003–10/2005–12解放军广州军区广州总医院脊柱外科收治的无骨折脱位型颈脊髓损伤患者27例，男22例，女5例，均伤后7 d内入院，并行手术治疗。根据患者的损伤情况采用3种方式，前路减压重建脊柱稳定，后路单开门+侧块固定，前路重建脊柱稳定+后路减压。疗效评价标准采用Frankel分级及JOA评分计算改善率。

结果与结论：全部患者均获得随访，随访时间6~33个月，平均18个月。影像学复查提示减压充分，内固定固定良好，未见松动滑脱、断裂等现象，融合节段1年后均获得良好骨性融合。27例患者出院时神经系统症状均有不同程度改善。除1例Frankel A级患者无明显恢复外，其余均恢复1~4级。置入后JOA评分较置入前有明显改善，其中前路减压重建脊柱稳定组改善率为50%，后路单开门+侧块固定组改善率为53%，前路重建脊柱稳定+后路减压组改善率为51%。所有病例置入中未出现血管、神经损伤等并发症，随访中亦无并发症发生。提示根据无骨折脱位型颈脊髓损伤的不同特点，采取合理方式，可获得较好疗效。

关键词：颈椎；脊髓损伤；无骨折脱位；外科治疗；硬组织植入物
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0 引言

无骨折脱位型颈脊髓损伤是指颈椎X射线、CT、MRI检查无骨折和脱位，但却有明显的颈脊髓损伤临床症状[1]。此病在临床上并非少见，随着对此类损伤认识的深入，现多主张早期手术治疗。2002–10/2005–12解放军广州军区广州总医院脊柱外科共收治27例无骨折脱位型颈脊髓损伤，根据受伤机制及影像学改变，分别采用3种方式，前路重建脊柱稳定、后路减压+侧块固定、前路重建脊柱稳定+后路减压，各组效果满意。

1 对象和方法

设计：回顾性病例分析。

时间及地点：病例来自2002–10/2005–12

解放军广州军区广州总医院脊柱外科。

对象：选择解放军广州军区广州总医院脊柱外科收治的无骨折脱位型颈脊髓损伤患者27例，男22例，女5例，年龄35~71岁，平均56.8岁，年龄< 50岁3例。纳入标准：27例患者均为过伸位损伤，影像学未见骨折脱位改变。排除标准：置入前影像学有骨折脱位等改变的则排除。伤前均有明确过伸位损伤病史，入院时JOA评分2~10分。27例患者在伤后7 d内入院，并行金属材料置入治疗。根据患者的损伤情况采用3种置入方式，前路减压重建脊柱稳定，后路单开门+侧块固定，前路重建脊柱稳定+后路减压。所有纳入临床研究病例都已告知患者本人及家属并经过同意，试验方案经医院伦理委员会批准。

影像学资料：虽然颈椎正侧位X射线未见明显骨折脱位，但27例患者均存在不同程度的影像学改变，其中发育性椎管狭窄14例，多节段颈椎间盘退变突出16例，6例存在颈椎多节段性不稳。21例MRI提示硬膜囊受压及珠网膜下腔狭窄或消失，脊髓肿胀、髓内水肿。

技术路线：

置入方式选择：①对以单节段颈椎间盘突出或脱出为主要表现者，选择前路减压重建脊柱稳定。②如为2节段椎间盘突出者且同时存在椎管储备间隙消失或减少的患者，则行前路重建脊柱稳定+后路减压。③对长节段脊髓信号改变，存在各种原因致椎管储备间隙消失或明显减少的患者，选择后路单开门+侧块固定小关节植骨融合。

前路减压重建脊柱稳定：全麻下，头颈过伸位，取颈前路正中偏右横切口，于乳突肌与舌骨肌群之间，动脉鞘与气管食管鞘间隙显露至椎体前方，切除病变间盘，充分减压后置入cage椎间植骨融合，前路钢板固定。

后路单开门+侧块固定：全麻下，俯卧位，取颈后正中切口，显露$C_{3\sim7}$两侧椎板，以一侧为轴，一侧为门，在不稳定椎体间行侧块钉棒系统固定，小关节植骨融合。

前路重建脊柱稳定+后路减压：全麻下，过伸位，取颈前路正中偏右横切口，于乳突肌与舌骨肌群之间，动脉鞘与气管食管鞘间隙显露至椎体前方，切除两病变椎间盘及中间椎体，充分减压后，置入钛网植骨融合。患者翻身俯卧位，取颈后正中切口，显露$C_{3\sim7}$两侧椎板，以一侧为轴，一侧为门，充分减压。

置入后处理：围置入期加强护理，应用类固醇激素等药物可以减轻细胞水肿，抑制氧化稳定溶酶体膜等，加强脱水，抗感染等对症支持治疗。引流管24~48 h即可拔除，置入后第3天可开始进行高压氧治疗，给予神经营养药治疗。鼓励患者在保护下活动下肢，置入后半年复查X射线平片植骨融合后，方可允许患者参加体力活动。

疗效判定：疗效评价标准采用Frankel分级[2]及JOA评分计算改善率[3]：

$$\text{JOA改善率}(\%)=(\text{置入后评分}-\text{置入前评分})/(17-\text{置入前评分})\times100\%$$

术者及试验参与人员资质情况：主刀为吴增晖教授，从事脊柱外科20余年，临床经验丰富，亲自主刀脊柱外伤、肿瘤及侧弯等方面手术千余例，成功率100%。参加手术配合人员均为副主任医师，从事脊柱外科15年。

主要观察指标：患者置入后Frankel分级及JOA评分改善率。

设计、实施、评估者：试验设计、评估为第一作者，干预实施为第二作者，经过正规培训，采用盲法评估。

统计学分析：由第一作者采用SPSS 10.0软件完成统计处理。

2 结果

2.1 随访情况 27例患者均获得随访，3例随访6个月，12例随访12个月，8例随访24个月，4例随访33个月，平均18个月。

2.2 治疗结果 影像学复查提示减压充分，内固定固定良好，未见松动滑脱、断裂等现象，融合节段1年后均获得良好骨性融合。

2.3 疗效评定 27例患者出院时神经系统症状均有不同程度改善。除1例Frankel A级患者无明显恢复外，其余均恢复1~4级(见表1)。置入后JOA评分较置入前有明显改善(见表2)。

表1 置入前及置入后Frankel分级
Table 1 Frankel grade before and after operation

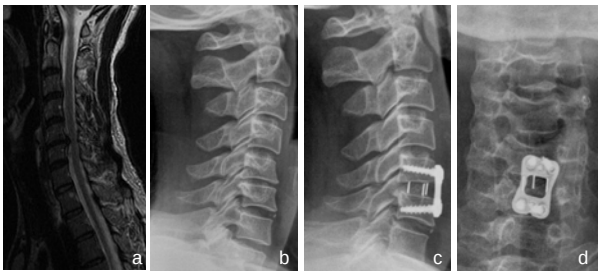
t	*n*	A	B	C	D	E
Before	27	2	3	19	3	0
After	27	1	1	2	16	7

表2 3种置入方式治疗前后JOA评分
Table 2 JOA score before and after surgical treatment
($\bar{x}\pm s$)

Item	Anterior decompression and reconstruction of spinal stability	Single-door and posterior lateral mass fixation	Anterior decompression and posterior reconstruction of spinal stability
Preoperative mean JOA (score)	8.00±1.41	6.38±2.28	7.20±0.84
Postoperative mean JOA (score)	12.50±1.05	12.00±1.86	12.20±1.30
Improvement rate(%)	50	53	51

2.4 不良反应 所有病例置入中未出现血管、神经损伤等并发症，随访中亦无并发症发生。

2.5 典型病例置入前后影像学表现 见图1~3。

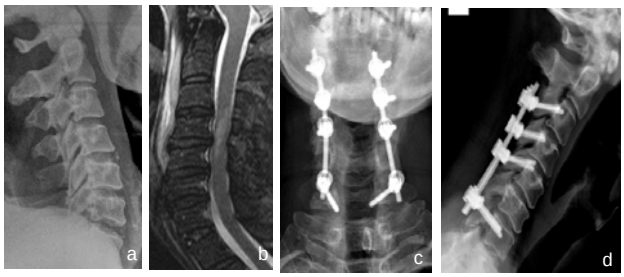


a: Preoperative X-ray shows no obvious fracture or dislocation

b: MRI shows signal changes C5/C6 spinal cord

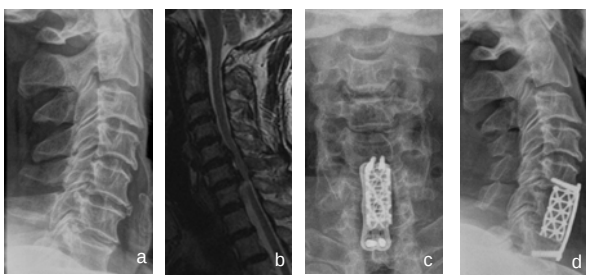
c, d: X ray images of anterior decompression and reconstruction of spinal stability during and after surgery and show good position of plate and cage

Figure 1 Single level cervical disc
图 1 单节段颈椎间盘突出



a: Preoperative X-ray shows no obvious fracture or dislocation; b: MRI shows cervical disc pan; c, d: X-ray of posterior lateral mass of a single door+fixation shows good position of cervical lateral mass screws and full spinal decompression

Figure 2 Multiple spinal cord signal change
图 2 多节段脊髓信号改变



a: Preoperative X-ray shows no obvious fracture or dislocation; b: Preoperative MRI shows C_{5-6} and C_{6-7} disc herniation as well as spinal stenosis; c, d: X ray of anterior decompression and posterior reconstruction of spinal stability+surgical shows steel and titanium mesh in good position and full spinal decompression

Figure 3 Multi-disc herniation with spinal stenosis
图 3 多节段椎间盘突出伴椎管狭窄

3 讨论

3.1 无骨折脱位型颈脊髓损伤的病理基础和发病机制 无骨折脱位颈脊髓损伤主要是以外伤引起的颈椎间盘突出或后方受损软组织挤压为主的脊髓损伤[4-5]。Koyanag等[6]报告90%患者存在颈椎退行性变。病理基础主要为发育性或退行性颈椎椎管狭窄、黄韧带肥厚钙化、后纵韧带肥厚或钙化，颈椎不稳、椎间盘突出或脱出等。本组88%(24/27)的病例受伤前存在颈椎退行性变。当椎管储备间隙较小、黄韧带及后纵韧带增生钙化明显时，在急性外伤中使得脊髓更容易受损，包括脊髓急性水肿、血肿、硬膜外血肿等。藏磊等[7]将损伤分为颈椎间盘突出型、椎管储备减少型以及在储备减少的基础上伴有节段性不稳或椎间盘脱出3种类型。因此各种原因导致的颈椎管狭窄和急性颈椎间盘突出或脱出是主要的病理原因，在此基础上颈部过伸位损伤致颈椎不稳脊髓损伤。由于损伤多累及脊髓中央部，周围部分较少累及，临床主要表现上肢运动障碍明显重于下肢，脊髓损伤平面以下的感觉障碍比较严重[8-9]。

3.2 影像学诊断 X射线检查时，椎间隙往往已恢复正常。动力位片检查可提示颈椎不稳，但可能加重神经损伤，需谨慎选择。但这并不代表X射线检查无意义，当X射线侧位片提示椎管矢状径< 12 mm，或者椎管与椎体的矢状径比值< 0.75，即可判定椎管狭窄[10]。Mahmood等[11]和Leypold等[12]报道MRI可早期发现脊髓肿胀、受压，椎间盘突出、后纵韧带及黄韧带对脊髓的压迫等。Goradia等[13]报告MRI对椎间盘和对后纵韧带损伤敏感度为93%，软组织和棘突为100%。但Song等[14]对81例过伸性颈椎损伤患者行MRI检查发现，颈椎周围软组织损伤信号改变与脊髓损伤程度无明显关系。作者认为，MRI检查是有一定的局限性，但能为诊断及选择置入方式和入路提供影像学依据。

3.3 早期治疗注意问题 早期诊治对本病预后尤为重要。早期使用类固醇激素可减轻细胞水肿、改善脊髓血运、阻止继发脊髓损害。根据美国急性脊髓损伤研究会(NASCIS)1990建议，超大剂量MP伤后8 h应用，第1小时首次冲击量为30 mg/kg，15 min快速静脉滴入，继而5.4 mg/(kg•h)，静滴维持23 h。1997年Bracken等[15]提出患者损伤3 h内应用MP治疗应维持24 h，3~8 h内应维持治疗48 h。大剂量的MP应用能明显减少脊髓细胞的死亡[16]。

3.4 无骨折脱位型颈脊髓损伤的治疗 国内外学者认为早期比晚期治疗疗效好，在伤后早期行减压和稳定手术可促使神经系统功能尽快恢复，减少并发症。置入目的是使椎管充分减压，固定不稳定椎体，为脊髓恢复创造条件[17-19]。结合复习文献和本组病例资料特点(多数患

者存在椎管储备间隙减少)作者认为：①以椎间盘突出压迫脊髓，无发育性椎管狭窄，无后纵韧带钙化，采取椎间盘摘除+前路钢板固定。②对于3节段及以上的颈椎间盘突出，髓核未破入椎管，黄韧带有钙化、骨化，存在椎管储备减少，采取后路单开门+侧块固定。③对于多节段间盘突出，1或2个间盘破入椎管，又存在椎管储备减少，采取前路重建脊柱稳定+后路单开门减压。对于第3种置入方式，作者认为应先做后路单开门减压再行前路置入方式，即使对脊髓有骚扰，也使脊髓有退让空间，防止脊髓休克或截瘫事件发生，这点尤为重要。单纯单开门手术可导致医源性脊柱不稳或加重原已存在或潜在的脊柱不稳，现多主张加用侧块螺钉固定。Mihara等[20]认为侧块螺钉固定的强度和稳定性足以满足头颈部活动需要。

4 参考文献

[1] Bosch PP, Vogt MT, Ward WT. Pediatric spinal cord injury without radiographic abnormality (SCIWORA): the absence of occult instability and lack of indication for bracing. Spine (Phila Pa 1976). 2002;27(24):2788-2800.

[2] Frankel HL, Hancock DO, Hyslop G, et al. The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia. I. Paraplegia. 1969;7(3):179-192.

[3] Japanese orthopaedic association critcrria on the evaluation of the treatment of cervical myelopathy. J Japan Orthop Assoc. 1976; 50Addenda:5.

[4] Flynn JM, Closkey RF, Mahboubi S, et al. Role of magnetic resonance imaging in the assessment of pediatric cervical spine injuries. J Pediatr Orthop. 2002;22(5):573-577.

[5] Gunnarsson T, Fehlings MG. Acute neurosurgical management of traumatic brain injury and spinal cord injury. Curr Opin Neurol. 2003; 16(6):717-723.

[6] Koyanag I, Iwasaki Y, Hida K, et al. Acute cervical cord injury without fracture or dislocation of the spinal column. J Neurosurg. 2000;93(1 Suppl):15-20.

[7] Zang L, Liu ZJ, Dang GT, et al. Zhonghua Chuangshang Guke Zazhi. 2004;6(7):781-784.
藏磊,刘忠军,党耕町,等.无骨折脱位型颈脊髓损伤的类型与治疗研究[J].中华创伤骨科杂志,2004,6(7):781-784.

[8] Song J, Mizuno J, Inoue T, et al. Clinical evaluation of traumatic central cord syndrome: emphasis on clinical significance of prevertebral hyperintensity, cord compression, and intramedullary high-signal intensity on magnetic resonance imaging. Surg Neurol. 2006;65(2):117-123.

[9] Wu HB, Yuan HS. Zhongguo Yixue Yingxiang Jishu. 2009;25(4): 689-691.
邬海博,袁慧书.MRI观察成人无骨折、脱位型颈脊髓损伤[J].中国医学影像技术,2009,25(4):689-691.

[10] Zhang YM, Pang CZ. Shiyong Yixue Yingxiang Zazhi. 2004;5(6): 316-318.
张宇明,庞辰珠.无骨折脱位颈脊髓损伤的影像学特点与外科治疗[J].实用医学影像杂志,2004,5(6):316-318.

[11] Mahmood NS, Kadavigere R, Avinash KR, et al. Magnetic resonance imaging in acute cervical spinal cord injury: a correlative study on spinal cord changes and 1 month motor recovery. Spinal Cord. 2008;46(12):791-797.

[12] Leypold BG, Flanders AE, Burns AS. The early evolution of spinal cord lesions on MR imaging following traumatic spinal cord injury. AJNR Am J Neuroradiol. 2008;29(5):1012-1016.

[13] Goradia D, Linnau KF, Cohen WA, et al. Correlation of MR imaging findings with intraoperative findings after cervical spine trauma. AJNR Am J Neuroradiol. 2007;28(2):209-215.

[14] Song KJ, Kim GH, Lee KB. The efficacy of the modified classification system of soft tissue injury in extension injury of the lower cervical spine. Spine (Phila Pa 1976). 2008;33(15):E488-493.

[15] Bracken MB, Shepard MJ, Holford TR, et al. Administration of methylprednisolone for 24 or 48 hours or tirilazad mesylate for 48 hours in the treatment of acute spinal cord injury. Results of the Third National Acute Spinal Cord Injury Randomized Controlled Trial. National Acute Spinal Cord Injury Study. JAMA. 1997;277(20): 1597-1604.

[16] Zurita M, Vaquero J, Oya S, et al. Effects of dexamethasone on apoptosis-related cell death after spinal cord injury. J Neurosurg. 2002;96(1 Suppl):83-89.

[17] Yang JS, Huang WD, Wang SB, et al. Zhonghua Chuangshang Zazhi. 2004;20(6):330-332.
杨进顺,黄文铎,王胜标,等.无骨折脱位型颈脊髓损伤手术与非手术治疗疗效对比观察[J].中华创伤杂志,2004,20(6):330-332.

[18] Mei SQ, Chen QX, Chen WS, et al. Linchuang Guke Zazhi. 2006; 9(4):301-302.
梅盛前,陈其昕,陈维善,等.无骨折脱位型颈脊髓损伤的手术治疗[J].临床骨科杂志,2006,9(4):301-302.

[19] Hendey GW, Wolfson AB, Mower WR, et al. Spinal cord injury without radiographic abnormality: results of the National Emergency X-Radiography Utilization Study in blunt cervical trauma. J Trauma. 2002;53(1):1-4.

[20] Mihara H, Cheng BC, David SM, et al. Biomechanical comparison of posterior cervical fixation. Spine (Phila Pa 1976). 2001;26(15): 1662-1667.