

前路后凸偏心撑开复位技术治疗下颈椎小关节脱位

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【摘要】目的:探讨前路后凸偏心撑开复位技术治疗下颈椎小关节脱位的临床疗效与安全性。**方法:**收集 2014 年 1 月~2017 年 12 月陆军军医大学第二附属医院骨科采用前路后凸偏心撑开复位技术治疗的下颈椎小关节脱位患者 63 例,其中男 55 例,女 8 例,年龄 21~73 岁(48.8±12.2 岁)。脱位节段:C3/4 4 例,C4/5 9 例,C5/6 26 例,C6/7 22 例,C7/T1 2 例;单侧脱位 22 例,双侧脱位 41 例。合并创伤性椎间盘突出 18 例,椎体骨折 20 例,关节突骨折 14 例。伤后 ASIA 分级:A 级 17 例,B 级 3 例,C 级 3 例,D 级 23 例,E 级 17 例。从受伤至手术的间隔时间为 3~64d(9.5±8.5d)。复位成功后,椎间置入装满自体骨的 cage 并用前路钢板椎体钉固定。术后随访 9~24 个月(15.7±5.1 个月)。分析其复位成功率、手术时间、术中出血量及出院后随访神经功能恢复情况(ASIA 分级)、融合率等指标。**结果:**63 例患者均顺利完成手术。经后凸偏心撑开复位技术直接复位成功 52 例(82.5%),其中包括单侧小关节脱位 22 例,双侧脱位 30 例;合并椎体骨折 15 例,关节突骨折 7 例;受伤至手术的间隔时间在 2 周以内 46 例,2~4 周 6 例;手术时间为 76.2±21.9min,术中出血量为 66.3±37.0ml。复位失败的 11 例患者辅以前路小关节突切除术,最终均成功复位。末次随访时,经后凸偏心撑开复位技术复位成功的 52 例患者中,20 例(38.5%)的 ASIA 分级至少升高 1 级(3 例术前 A 级患者末次随访时升至 B 级 2 例、C 级 1 例,3 例由术前 C 级升至 D 级,14 例由术前 D 级升至 E 级),其余 32 例的 ASIA 分级保持不变(包括 9 例 A 级,2 例 B 级,7 例 D 级及 14 例 E 级);融合率为 100%,无内固定松动、断裂。**结论:**前路后凸偏心撑开复位技术复位下颈椎小关节脱位成功率高、手术操作简单、创伤小、安全有效。

【关键词】下颈椎;小关节脱位;前路复位;后凸偏心撑开

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An anterior kyphotic paramedian distraction technique for reduction of cervical facet dislocation/LIU Ke, DENG Jue, ZHANG Zhengfeng//Chinese Journal of Spine and Spinal Cord, 2019, 29(1): 49-54

【Abstract】Objectives: To explore the clinical efficacy and safety of anterior kyphotic paramedian distraction technique for reduction of cervical facet dislocation. **Methods:** From January 2014 to December 2017, there were 63 cases of lower cervical facet dislocation which were treated by anterior kyphotic paramedian distraction technique in our hospital. There were 55 males and 8 females, with an average age of 48.8±12.2 years (range, 21 to 73 years). The injury segments were C3/4 in 4 cases, C4/5 in 9 cases, C5/6 in 26 cases, C6/7 in 22 cases, C7/T1 in 2 cases. Dislocation types were unilateral facet dislocation in 22 cases and bilateral facet dislocation in 41 cases. There were 18 cases with traumatic disc herniation, 20 cases with vertebra fracture and 14 cases with articular process fracture. The spinal cord injury grade(American Spinal Injury Association, ASIS) at admission was ASIA grade A in 17 cases, grade B in 3 cases, grade C in 3 cases, grade D in 23 cases, grade E in 17 cases. The preoperative time was from 3 to 64 days(average, 9.5±8.5 days), and follow-up ranged from 9 to 24 months (average, 15.7±5.1 months) after surgery. After successful reduction, cage with autogenous bone and anterior plate fixation were implanted. And then the success rate of reduction, operation time, intraoperative blood loss, the ASIA grade and fusion rate at the last follow-up were analyzed. **Results:** All the 63 patients were successfully treated. Fifty-two cases(82.5%) were directly reduced by anterior kyphotic paramedian distraction technique, including 22 cases of unilateral facet dislocation, 30 cases of bilateral facet dislocation, 15 cases with vertebra fracture and 7 cases with articular process fracture.

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The preoperation time was less than 2 weeks in 46 cases and 2–4 weeks in 6 cases. The mean operation time was 76.2 ± 21.9 minutes and the mean blood loss was 66.3 ± 37.0 ml. The other 11 patients with failed reduction needed to be assisted with anterior facetectomy, and all of them were successfully reduced. At the last follow-up, 20(38.5%) of 52 patients with successful reduction by anterior kyphotic paramedian technique increased the ASIA grade by at least one grade (including 3 cases with preoperative grade A to grade B in 2 cases and grade C in 1 case at the last follow-up, 3 cases from grade C to grade D, 14 cases from grade D to grade E), and the other 32 cases remained ASIA grade unchanged (including 9 cases of grade A, 2 cases of grade B, 7 cases of grade C, 14 cases of grade E). All patients achieved satisfactory fusion, and there was no implant failure. **Conclusions:** Anterior kyphotic paramedian distraction technique for reduction of lower cervical facet dislocation has the advantages of high success rate, simple operation, less trauma, safe and effective clinical result.

【Key words】 Lower cervical spine; Cervical facet dislocation; Anterior reduction; Kyphotic paramedian distraction

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下颈椎小关节脱位(lower cervical facet dislocation)是一种由屈曲牵张暴力引起的脊柱创伤,通常会导致脊柱三柱结构的破坏,往往伴有椎间脱位、小关节突绞锁和椎间盘的破坏。治疗策略需尽早复位、减压,恢复原有的椎间高度及正常颈椎序列,重建颈椎的稳定性。既往已有文献^[1-3]报道采用闭合、前入路或后入路等不同手术方式完成复位固定融合,然而传统的复位技术都有其弊端:闭合复位成功率相对较低;后路易于复位但对于合并创伤性椎间盘突出的患者,复位过程中造成脊髓压迫及神经功能恶化的风险较高;传统的前路复位技术是在椎间盘完全切除后进行,虽能保证手术安全性,但复位成功率仍不高。因此,为了提高复位成功率及手术安全性,我们采用“后凸偏心撑开复位”的前路复位技术对 63 例下颈椎小关节脱位患者进行了手术,术后随访 9 个月以上,取得了理想的临床效果,报告如下。

1 资料与方法

1.1 患者资料

收集陆军军医大学第二附属医院骨科 2014 年 1 月~2017 年 12 月收治的下颈椎脱位手术患者 63 例。其中男 55 例,女 8 例,年龄 21~73 岁(48.8 ± 12.2 岁)。脱位节段分布:C3/4 4 例,C4/5 9 例,C5/6 26 例,C6/7 22 例,C7/T1 2 例;单侧脱位 22 例,双侧脱位 41 例。合并创伤性椎间盘突出 18 例,椎体骨折 20 例,关节突骨折 14 例。伤后美国脊髓损伤协会(American Spinal Injury Association, ASIA)分级^[4]结果:A 级 17 例,B 级 3 例,C 级

3 例,D 级 23 例,E 级 17 例。受伤至手术的间隔时间为 3~64d(9.5 ± 8.5 d),其中在 2 周内 53 例,2~4 周 9 例,大于 4 周 1 例。随访时间为术后 9~24 个月(15.7 ± 5.1 个月)。

1.2 手术流程

所有患者在术前均行颈椎正侧位 X 线片、CT 及 MRI 检查以明确颈椎骨折脱位节段、程度及脊髓受压情况,术中复位及手术操作均在体感诱发电位(somatosensory evoked potentials, SSEP)和运动诱发电位(motor evoked potentials, MEPS)监测下完成。

患者在全麻下处于仰卧位,C 型臂 X 线透视确定脱位节段后行一横向皮肤切口和标准的史密斯-罗宾逊入路^[5]暴露至损伤节段,将两个椎体撑开钉(Caspar pins)的进针角度与方向以大约 $10^\circ \sim 20^\circ$ 的角度倒“八”字置入,而且上位 Caspar pin 的进针点及方向均偏向脱位关节侧(偏移距离及角度以脱位小关节与 Caspar pin 基本处于同一直线上),以保证撑开时为一种后凸偏心的方式,使脱位关节受力更直接(图 1、2)。前路完全切除椎间盘,彻底减压。在透视下逐渐撑开至绞锁的关节分离,然后旋转上位椎体并同时给予一个向背侧的力量缓慢旋转以达到复位(图 1)。复位成功后,椎间置入装满自体骨的 cage 并用前路钢板椎体钉固定。对于复位失败的患者,继续在后凸偏心撑开情况下行前路绞锁的小关节切除术^[6]。

术后均给予引流管引流 2~3d,佩戴颈托 6~8 周。并嘱患者定期随访,观察神经功能恢复情况以及复查颈椎 X 线片评估融合情况。

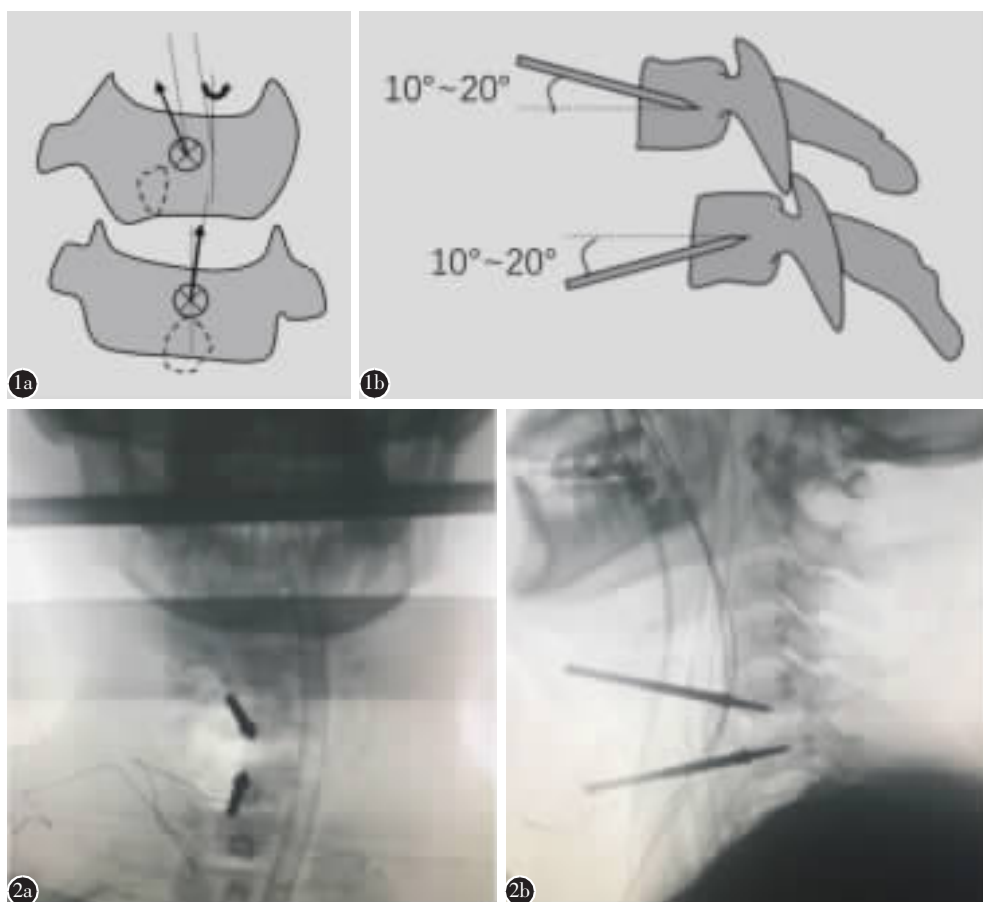


图 1 后凸偏心撑开技术示意图 **a** 右侧小关节绞锁正位观,上位椎体旋转,棘突偏向右侧,上位椎体进针点则偏右侧,进针方向偏向右侧,下位椎体进针点位于正中并垂直进针 **b** 小关节绞锁侧位观,两个椎体撑开钉(Caspar pins)以大约 $10^{\circ}\sim 20^{\circ}$ 的角度倒“八”字置入 **图 2** 患者 52 岁男性,C5/6 右侧小关节绞锁,C5 棘突稍旋向右侧 **a** 术中透视正位显示上位 Caspar pin 的进针点及方向均偏向小关节绞锁侧 **b** 术中透视侧位可见两个 Caspar pins 以大约 10° 到 20° 的角度倒“八”字置入

Figure 1 The kyphotic paramedian distraction technique **a** The anterior view showed the right facet locks with the upper vertebral body and the spinous process tilted to the right, the entry point and direction of the upper pin were inclined to the right side in the axial plane, the entry point of the inferior pin was in the center, and perpendicular in direction **b** Placing Caspar pins at approximately a 10° to 20° angle with respect to each other in the sagittal plane

Figure 2 A 52-year-old man with a dislocated C5/6 right facet, whose C5 spinous process rotated to the right **a** Intraoperative fluoroscopy showed that the entry point and direction of the upper pin were inclined to the right side **b** Two caspar pins were placed at approximately a 10° to 20° angle with respect to each other in the sagittal plane

1.3 测量与评价指标

统计复位成功率以评价技术的有效性,分析手术时间、术中出血量以评价手术创伤的大小,末次随访时的 ASIA 分级以评价术后神经功能恢复情况,复查颈椎 X 线片以评价术后融合情况(融合被定义为上下椎体之间移植骨的骨小梁形成)。

1.4 统计学方法

应用 SPSS 23.0 软件进行数据录入及统计分析。采用 χ^2 检验比较单侧与双侧小关节脱位组别

间的复位效果,用 Fisher 确切概率比较不同的受伤至手术间隔时间组别间的复位效果, $P<0.05$ 为差异有统计学意义。

2 结果

63 例患者均顺利完成手术,均无椎动脉或神经损伤,未行后路手术。其中经后凸偏心撑开技术直接复位成功 52 例(82.5%),包括单侧小关节脱位 22 例(100%),双侧脱位 30 例(73.2%),单侧小

关节脱位组复位成功率明显高于双侧脱位组($\chi^2=5.411, P=0.020$);合并椎体骨折 15 例(75%),关节突骨折 7 例(50%);受伤至手术间隔时间在 2 周以内的复位成功 46 例(86.8%),2~4 周复位成功 6 例(66.7%),大于 4 周 1 例患者复位失败,不同术前间隔时间组之间复位成功率有显著性差异($P=0.031$),且时间越短复位成功率越高;手术时间为 $76.2\pm 21.9\text{min}$ (40~120min),术中出血量为 $66.3\pm 37.0\text{ml}$ (20~150ml)。复位失败的 11 例患者均为双侧小关节脱位,其中 2 例为 C7/T1 小关节脱位,5 例存在严重的椎体骨折,7 例合并小关节骨折,受伤至手术间隔时间为 $16.5\pm 16.4\text{d}$ (6~64d) [其中 3 例为 2~4 周(16d, 17d 及 21d),1 例大于 4 周(64d)],采用前路小关节突切除术后均成功复位。

末次随访时,经后凸偏心撑开复位技术复位成功的 52 例患者中,20 例(38.5%)的 ASIA 分级至少升高 1 级(3 例术前 A 级患者末次随访时升至 B 级 2 例和 C 级 1 例;3 例术前 C 级升至 D 级;14 例术前 D 级升至 E 级),其余 32 例的 ASIA 分级保持不变(包括 9 例 A 级,2 例 B 级,7 例 D 级及 14 例 E 级),没有 1 例出现分级下降。植骨融合率为 100%,且没有病例出现内固定松动、断

裂(图 3)。

3 讨论

目前关于治疗下颈椎小关节脱位的手术策略及复位方法分为单纯前路、单纯后路、前-后路联合、后-前路联合及前-后-前联合入路复位内固定^[7,8],复位方法则可分为闭合、前路、后路复位三种类型。

以往最先被大家接受的是先行闭合复位,成功率可达 30%~100%^[9-12]。由于后方的小关节绞锁才是复位过程中的主要障碍,后路复位技术应用越来越多。后路复位有易于复位、坚强内固定及利于恢复颈椎正常序列等优点,但也有许多缺点:(1)对于合并创伤性椎间盘突出的患者,可能在复位过程中使前方脊髓受压而导致神经功能进一步恶化;(2)需要固定的节段更长,创伤更大,感染风险更高;(3)术后出现慢性轴性痛;(4)合并有椎间盘损伤者可能需要行前路手术^[13-15]。之后,随着复位技术的增多及提高,大家对下颈椎小关节脱位与创伤性椎间盘突出的关系有了更多关注。据以往的文献报道,约 10%~50%的下颈椎小关节脱位合并有创伤性椎间盘突出^[16-20]。Rizzolo 等^[15]报道单侧小关节脱位和双侧小关节脱位合并椎间盘破裂



图 3 男性患者,53 岁,C5/6 单侧小关节绞锁 a 术前 CT 三维重建示 C5/6 右侧小关节绞锁 b 术前 MRI 矢状位抑脂像示 C5 向前滑脱,C5/6 椎间盘损伤,脊髓轻度受压 c 行前路 Caspar pins 后凸偏心撑开复位+椎体螺钉钢板内固定,术后第 2 天复查侧位 X 线片显示内固定牢固在位 d 术后 3 个月复查侧位 X 线片示 C5/6 椎间连续骨小梁形成

Figure 3 a Preoperative 3D reconstruction CT scan of a 53-year-old man with a C5/6 unilateral facet dislocation b The fat suppression sagittal MRI displayed that C5 had slipped forward, C5/6 disc got injury, and the spinal cord was slightly compressed c The X-ray lateral image on the second day after a kyphotic paramedian distraction technique and cervical locking plate fixation showed that the internal fixation was firmly in position d Follow-up at 3 months, the lateral radiograph showing trabecular formation in the graft bone between C5 and C6 vertebrae

的发生率分别达 40% 和 80%。本研究中,有 18 例 (28.6%) 合并有创伤性椎间盘突出。但是, MRI 仅是诊断小关节脱位合并创伤性椎间盘突出的有效工具,而不能预测椎间盘突出在复位过程中的转归。既往也有相关研究报道^[14,21~23],仅有椎间盘损伤破裂而不突出者,在复位过程中可能会再突出压迫脊髓。

前路复位是在前路椎间盘切除术后进行的,由于其具有医源性软组织损伤小、感染率低、继发脊髓损伤风险小等优点,从而得到许多医生的支持^[1,2,24]。Ordóñez 等^[24]报道了一些前路复位颈椎小关节半脱位的方法,例如将两 Caspar pins 在矢状面上呈 10°~20° 的角度放置,撑开时以利于脱位的关节解锁;辅以手法给上位椎体施加背向压力,用刮匙作为杠杆臂向背侧撬拨,以及椎间盘间撑开器撑开等方法以纠正脱位。然而,此技术两 Caspar pins 间夹角共 10°~20°,撑开角度有限,且进钉点及进针方向为正,不能将作用力直接作用于脱位小关节处,因此利用传统复位技术对 2 周以内的颈椎小关节脱位复位率为 60%~100%,对于一些顽固性或双侧小关节绞锁,尤其是陈旧性小关节脱位的患者,前路复位失败率则高达 25%~40%^[1,2,25,26]。

本研究结果表明,后凸偏心撑开复位技术是一种安全、有效的下颈椎小关节脱位复位方法,成功率可高达 80% 以上,其关键技术及原理如下:(1) 两个 Caspar pins 以大约 10°~20° 的角度倒“八”字置入,比传统技术撑开的角度更大,且撑开时可模拟脱位节段屈曲,实现后凸牵张使小关节半脱位,便于复位;(2) 上位椎体进钉点及进针方向均偏向脱位侧,则可以使脱位的关节所受撑开力更大更直接。与传统复位技术相比,“后凸偏心撑开复位”技术不仅可以使绞锁的关节受力更直接,复位成功率更高,而且还可以减少过度牵引对脊髓牵拉的风险。此法对单侧小关节脱位的复位率几乎可以达到 100%,即使是对双侧小关节脱位、合并有椎体骨折或关节突骨折、时间大于 2 周的陈旧性脱位等难复性病例仍有较高的复位成功率。经过至少 9 个月的随访,所有病例均获得了牢固的固定和满意的融合。

当然,从本研究的结果来看,后凸偏心撑开复位技术也有其局限性:(1) 撑开时脱位椎体受力较大,要求前方椎体特别是脱位侧椎体完整且不合

并有严重的骨质疏松;(2) 复位时需撑开关节突关节至半脱位,要求后方附件特别是下关节突相对完整;(3) 受伤时间过长会导致严重的瘢痕增生或后方关节突融合,造成撑开困难,因此受伤时间最好在 2 周以内,且越短越好。所以,以下患者仅利用后凸偏心撑开技术复位的效果欠佳,为其相对禁忌证:(1) 合并前方严重的椎体骨折或重度骨质疏松;(2) 后方附件严重破坏,合并关节突严重骨折、悬浮椎;(3) 伤后时间大于 2 周甚至大于 4 周的陈旧性骨折,瘢痕增生严重或后方关节突融合。

综上所述,利用前路后凸偏心技术复位下颈椎小关节脱位成功率高、手术操作简单、创伤小、安全有效,值得临床推广应用。

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