·儿童脊柱畸形与疾病专题·

Ⅰ期后入路楔形切除术治疗低龄儿童半椎体畸形

宿玉玺[1] 谢 艳[2] 覃佳强[1] 南国新[1] 王忠良[1] 蔡文全[1] 张德文[1]

【摘要】 **目的** 探讨 CD 三维矫形系统在矫正低龄儿童半椎体所致脊柱畸形中的应用方法、意义、并发症的处理及术后处理。 **方法** 2011 年 7 月至 2014 年 6 月我们应用 CD 系统矫治低龄儿童半椎体所致脊柱侧后凸畸形 27 例,其中单纯性半椎体合并脊柱侧凸 12 例,半椎体合并脊柱侧、后凸 15 例。27 例中,合并蝴蝶椎等复杂分节不良畸形 6 例,合并单侧肾脏缺如 1 例。术前冠状面侧凸 Cobb 角 24°~45°,平均 32°;矢状面脊柱后凸 Cobb 法 0°~ 21°,平均 15.5°,旋转畸形为Ⅰ~Ⅲ度。年龄 1 岁 10 个月至 5 岁 8 个月。手术均采用后路融合,固定点为需切除的病变椎上下椎体,若遇上下椎体有畸形不宜植钉,则适当上或下移一椎体。先固定凹侧,楔形切除半椎体附件及椎体,凸侧加压,钉棒系统固定。**结果** 所有患儿术后经 1~36 个月(平均 16 个月)随访,冠状面畸形为 5°~15°,平均 11.5°,平均矫正率为 64.1%;矢状面胸椎后凸 0°~10°,平均 6°,旋转畸形矫正。1 例出现断钉 1 枚,但无症状及矫正丢失。无一例术后出现截瘫,无断棒及钉拔出等并发症。10 例术后出现不同程度腹胀、腹痛现象,经对症处理后 3~7 d 内明显缓解或消失。无一例出现伤口感染。15 例术后出现 10°以上代偿性侧弯,支具矫正后逐渐重新建立躯干平衡。 **结论** 后入路切除半椎体,畸形外观改善明显,脊柱侧后凸程度明显减轻,但要彻底切除半椎体上下生长板,减少凸侧生长点,防止复发;同时切除对侧附件,达到楔形截骨的效果,才能使矫形无张力,不易出现“拔钉”现象。

【关键词】 脊柱/畸形; 内固定器; 治疗; 儿童

Resection of the hemivertebra from the back by the first stage in younger children. *SU Yu-xi*, *XIE Yan*, *QIN Jia-qiang*, *et al*. 1, Department of orthopaedics Children's hospital of Chongqing Medical University; 2, Stem cell laboratory, Ministry of Education Key Laboratory of Child Development and Disorders, Chongqing Yubei district maternity and child care hospital lab medicine, Chongqing 400014, China

【**Abstract**】 **Objetive** To study the surgical method, clinical significance, management of complications and postoperative treatment of edge-shaped resection the hemivertebra from the back by the first stage in young children using the CD three-dimensional orthopedic system. **Methods** From July 2011 to June 2014, We adopted CD three-dimensional orthopedic system to correct 27 cases congenital kyphoscoliosis caused by hemivertebra deformities. There were 12 cases combination of scoliosis and hemivertebra. There were 15 cases combination of kyphoscoliosis and hemivertebra. There were 6 cases complex combination of butterfly vertebrae and vertebral segmentation defects. There was 1 case combined with Kidney deficiency. The lateral convex Cobb Angle was 24° to 45° from, an average of 32°, the sagittal convex Cobb Angle was 0° to 21°, on average of 15.5°, rotational deformity was Ⅰ~Ⅲ degrees. The age ranged from 1 year 10 months to 5 years 8 months. All the patients adopted posterior fusion, the up and down vertebral body were fixed. If there was lesion of the vertebral body the upper or the downer were fixed. The concave side was fixed firstly, Wedge-shaped resection the hemivertebra were performed, vertebral body accessories and vertebral body were totally removed and then

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作者单位:1,重庆医科大学附属儿童医院骨科,干细胞实验室,儿童发育疾病研究教育部重点实验室儿科学重庆市重点实验室(重庆市,400014),2,重庆市渝北区妇幼保健院检验科(重庆市,400010),通讯作者:覃佳强,E-mail:13637901949@126.com

the convex side was fixed. **Results** After 1 ~ 36 months following up(16 months on average), The lateral convex Cobb Angle was 5° to 15° from, on average was 11.5°, the average correct rate was 64.1%. The sagittal convex Cobb Angle was 0° to 10°, an average of 6°, rotational deformity was totally corrected. One pin was broken in one patient, but it had no symptoms and correction loss. There was no complications such as paraplegia, rod broken, or pin pulled out. 10 cases had the phenomenon of abdominal distension and abdominal pain, but they all relieved when they were symptomatic treated for 3 ~ 7 days. There was no wound infection. 15 patients had the compensatory side-bending at least 10 degrees, then they were treated by the braces and they were gradually established balance again after operation. **Conclusions** The surgery results showed that resection of the hemivertebra could get the appearance. The kyphoscoliosis could be relieved. The growth plate of the hemivertebra should be totally removed in case of recurrence. The opposite vertebral body attachment should also be eradicated, thus there is no tension when they were fixed, and the pin is hardly be pulled out after surgery.

【**Key words**】 Spine/AB; Internal Fixators; Therapy; Child

先天性脊柱侧弯是由于脊椎形成不良或分节不良所致,其弧度进展与脊椎发育缺陷的类型相关[1]。最有可能进展的是那些存在单侧不分节骨桥的半椎体,骨桥限制了该侧生长而对侧生长依然保持正常,从而导致生长不平衡。继发于半椎体的进行性脊柱侧弯和脊柱进行性失衡是目前公认的手术指征[2]。我们于 2011 年 7 月至 2014 年 6 月采用 CD 系统矫治低龄儿童半椎体所致脊柱侧后凸畸形 9 例,现报道如下:

材料与方法

一、临床资料

2011 年 1 月至 2014 年 6 月,我们采用 CD 系统矫治儿童先天性半椎体 27 例,其中单纯性半椎体合并脊柱侧凸 12 例,半椎体合并脊柱侧、后凸 15 例。27 例中,合并蝴蝶椎等复杂分解不良畸形 6 例,合并单侧肾脏缺如 1 例。随访 4 个月至 3 年,平均 2.6 年。术前冠状面侧凸 Cobb 角 24° ~ 45°,平均 32°;矢状面脊柱后凸 Cobb 法 0° ~ 21°,平均 15.5°,旋转畸形Ⅰ ~ Ⅲ度。年龄 1 岁 10 个月至 5 岁 8 个月。

二、术前准备及内固定材料

常规拍摄 91.44 cm(36 英寸)站立脊柱正侧位 X 线片,三维 CT 成像显示椎体后方附件和前方融合,评估半椎体结构以及其与上下椎体的关系;检查有无其他疾病,如脑和脊髓的磁共振、心脏及泌尿生殖系统超声检查,根据东方儿童的脊柱平均解剖数据及生长发育特点而设计的中华长城内固定器械。

三、手术方法

患儿俯卧于可透 X 线的脊柱手术台上,前胸和髂嵴处加软垫,保持腹部悬空以利静脉回流通畅,身体凸侧宜垫高 10° ~ 20°,以利于硬膜和出血均远离手术切除部位,准备感觉和运动体感诱发电位监测。常规后方入路,标准后方附件显露,采用低血压麻醉,维持平均动脉压 65 ~ 70 mmHg,以防出血过多,用标准技术将螺钉打入半椎体上下方凹凸两侧的椎体。对 8 岁以下儿童,我们采用 4.5 mm 钉棒系统,8 岁以上儿童选用 5.5 mm 钉棒系统,婴幼儿采用 4 mm 或 3.5 mm,术前可三维 CT 测量参考。螺钉的位置可通过 X 线透视和诱发肌电图来确定,安置螺钉后以标准方法置入椎板钩。切除半椎体前,先切除半椎板,用锥板咬骨钳首先切除黄韧带再向尾侧切除半椎体,切除半椎体时从中间向外侧进行直到关节小面,同时切除横突,手术过程中避免损伤相应节段的神经根。半椎体切开前在椎板两侧放置自动牵开器牵开保护周围组织,高速磨钻去除椎弓根的松质骨部分,用小咬骨钳或刮匙刮除骨皮质部分,注意用神经根牵开器保护硬脊膜防止受损。注意椎弓根往下剥离就是椎体。椎弓根的内侧壁与半椎体相连,显露半椎体时要避开硬膜外静脉丛血管,这样可以避免过多出血,用双极电凝预防性止血,必须在可视状态下切除椎弓根部分,以保护其上下方的神经根。从椎弓根向下切除整个半椎体,若有硬膜外出血及时使用双极电凝止血,也可以用吸收性明胶海绵或纤维蛋白棉止血。用牵开器牵开神经组织后,可清晰看到椎弓根切除后的半椎体部分,由于半椎体上下的椎间盘与椎体紧密粘合,故切除其上下椎间盘较困难,我们的目标是完整切除上下椎间盘并切除到凹侧的半椎体。一旦楔形切除完成,畸形就可以矫正了。最后在连接两侧椎弓根螺钉的两棒之间用一横联合杆。手术区椎板去皮质后将切除半椎体的碎骨块连同自体或同种异体骨覆盖区融合。

逐层关闭切口,置引流管。

四、术后处理

术后 3 d 内根据引流情况,一般 24 h 内出血量少于 30 mL,可拔除引流管,术后 7 d 出院。对于年幼的患儿,采用支具保护 6 ~ 8 周。术后 1 d、4 周、3 个月复查 X 线片评估融合情况,若融合情况好,可负重开始功能训练,术后 6 个月开始恢复正常活动。

结　果

27 例术前冠状面侧凸 Cobb 角 24° ~ 45°,平均 32°;矢状面脊柱后凸 Cobb 角 0° ~ 21°,平均 15.5°,旋转畸形为Ⅰ ~ Ⅲ度。术后经 1 ~ 36 个月(平均 16 个月)随访,冠状面畸形为 5° ~ 15°,平均 11. 5°,平均矫正率为 64.1%;矢状面胸椎后凸 0° ~ 10°,平均 6°,旋转畸形矫正。1 例出现断钉 1 枚,但无症状及矫正丢失。无一例术后出现截瘫,无断棒及钉拔出等。7 例术后出现不同程度腹胀、腹痛,经对症处理后 3 ~ 7 d 明显缓解或消失。无一例伤口感染。5 例术后出现 10°以上角度代偿性侧弯,支具矫正后逐渐建立躯干平衡。

表 1　27 例患儿手术前后 Cobb 角($\bar{x} \pm s$)

时间	Cobb 角	
	冠状面	矢状面
术前	30.5° ±8.5°	9.5° ±1.5°
术后	12.5° ±12°	4.5° ±1.5°

典型病例:患儿,女,1 岁 11 个月,先天性胸 11 半椎体畸形,术前脊柱柔韧性良好,Cobb's 角 27.1°,楔形截骨去除半椎体,钉棒固定上下两个椎体,术后恢复良好,见图 1 ~ 2。

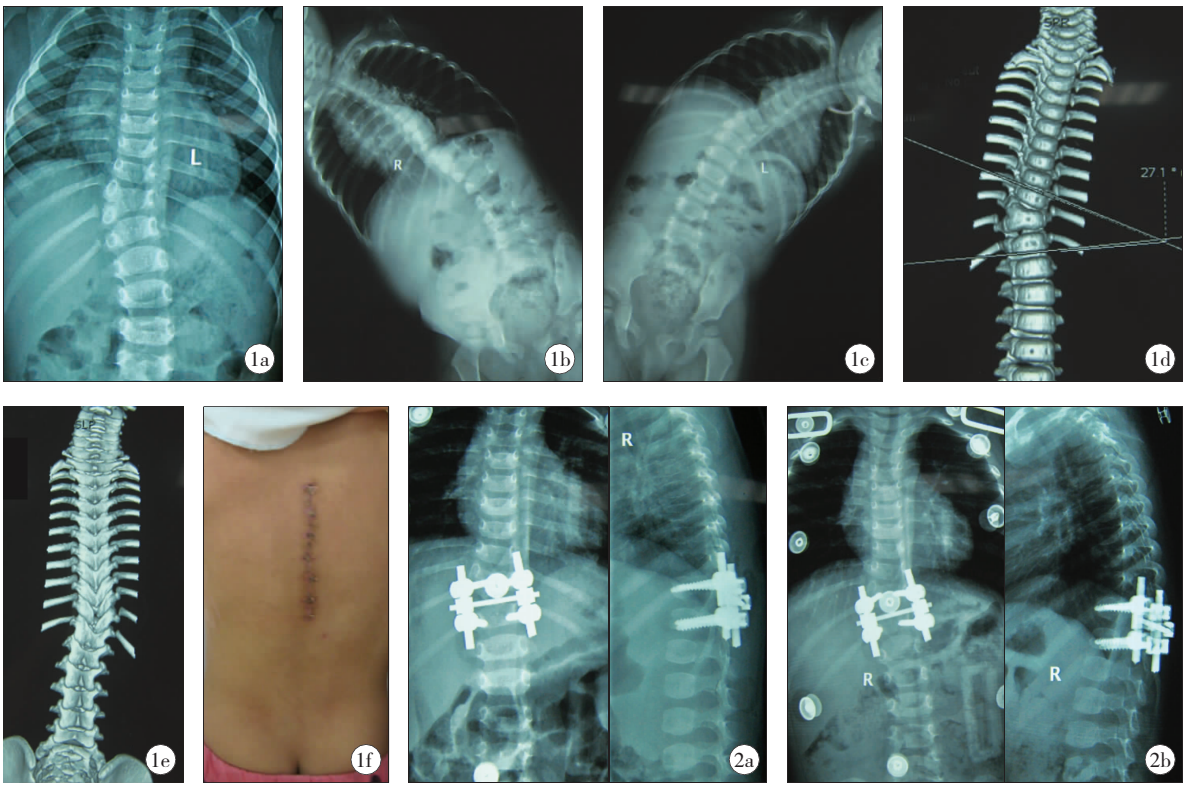

图 1　患儿术前 X 线正位片及左右板正像:a,先天性胸 11 半椎体;b、c,左右板正像提示脊柱弯曲度良好,d、e、f 提示三维 CT 重建及术后恢复外观;　**图 2**　术后 7 d X 线正侧位片,a,半椎体完全切除,椎弓根螺钉固定上下两个椎体,Cobb's 角恢复满意,b,术后 3 个月患儿佩戴支具矫正代偿性侧弯,效果满意。

讨　论

脊柱的先天性结构缺陷可导致多种脊柱弯曲,这些弯曲的弧度常表现为复杂畸形,需借助影像学检查来评估[3]。这些畸形的发生是由于胚胎期体节形成异常,在同一体节常出现相关病变。一旦发现有先天性脊柱侧弯,尤其是累及胸腰段者,应进一步行泌尿系统超声检查,且应考虑到合并诸如 VACTERL(脊柱畸形、肛门闭锁、心脏异常如法洛氏四联征、气管食管瘘、肾发育不全和桡骨发育不良)等相关综合征的可能[4,5]。半椎体切除术适用于低龄儿童胸腰椎连接处或以下的并发脊柱失衡的严重侧弯,经保守治疗 6 ~ 8 个月无效的患儿。

手术过程中需注意以下几点:常规单极和双极电刀可防止出血过多,向两侧广泛剥离到横突尖端,手术前应通过 CT 影像了解后方附件,明确半椎板与其上下的解剖关系以确定其正确水平,对分裂的结构有清醒认识,以避免误入椎管[6,7]。一旦横突完全显露,用透视或拍 X 线片定位,辨认清楚半椎体的椎弓根及半椎体上下的椎弓根。在切除半椎体术前,准确安置内固定[6]。可通过术前影像学检查研究椎弓根的解剖[7]。一般情况下,半椎体上下方的椎弓根大小足以容纳椎弓根螺钉的置入[7,8]。年幼患儿椎弓根没有足够的强度支撑切除后闭合椎板空隙的压力,因此我们在上下锥体板固定钩之间放置加压棒对切除后的空隙加压,保护硬脊膜和神经根。椎板钩加用两根棒,使固定结构更稳定,然后通过透视明确畸形矫正达理想状态。

手术最大的并发症是神经损害,目前我们尚未遇到,但文献有类似报道[9]。我们体会,术前细致的影像学和生理学检查,尤其是 MRI 是必须的。手术应在神经电生理监护下,预防神经根损伤的关键在于掌握其在椎弓根上下的位置。椎弓根切除后进行矫形时必须直视和保护神经根,术前应通过平片和 CT 检查全面评估解剖结构,避免术中混淆,定位错误。通过 CT 明确椎板裂和椎板融合有助于避免术中出错。此外,术前需拍摄板正像,确定半椎体周围有足够的活动度,当活动度较好时,半椎体切除后脊柱才能变直[9]。在幼儿,会有一层完整的软骨和骨膜从前方和外侧将游离椎体隔开,这时椎弓根会变宽,要注意保持椎弓根内壁和椎体后壁完整。手术须完整切除半椎体上下方的椎间盘,同时切除上下椎体的生长板。有时需切除上下椎体的部分骨质,这时上下椎体内的椎弓根螺钉可能会外露,说明切骨过多[10]。我们曾遇到过上述情形,而不得不将固定节段下移或下移、增加固定节段。手术最困难的莫过于如何切除超过中线的半椎体,我们的经验是将刮匙将组织向上刮出,椎弓根外壁通常会破裂,会有落空感,轻柔牵开神经根和硬膜,完整切除半椎体,这样楔形间隙应能闭合,此时出血量较多,使用双极止血,若止血效果不佳需用脑棉等稍加压止血[11]。此外,患儿年龄偏小,术后可能发生矫形过程中椎弓根切割问题,本文图 2 所示病例即发生椎弓根切割问题,幸运的是患儿目前尚无症状,今后的实践中应继续采用合适的椎弓根螺钉以及反复透照确认较佳位置等以减少该并发症的产生。

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