

· 临床研究 ·

经椎弓根部位椎体楔形截骨治疗骨质疏松性脊柱陈旧性骨折伴后凸畸形

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【摘要】 目的:探讨后路经椎弓根部位截骨矫形术治疗骨质疏松性脊柱陈旧性骨折伴后凸畸形临床效果。方法:2009年7月至2014年2月采用后路经椎弓根截骨矫形治疗26例骨质疏松性陈旧性脊柱骨折伴后凸畸形的患者,其中男10例,女16例,年龄55~75岁,平均67岁;胸椎1例,胸腰椎21例,腰椎4例;共29个椎体骨折,单椎体骨折23例,双椎体骨折3例;术前后凸Cobb角为 $32^{\circ}\sim 51^{\circ}$,平均 $(42.00\pm 4.75)^{\circ}$;VAS评分6~9分,平均 (8.40 ± 0.75) 分,脊髓功能按Frankel分级:D级4例,E级22例。记录术中出血量、手术时间及围手术期并发症,采用X线片观察Cobb角改善情况,应用VAS评分评价疼痛缓解情况,应用Frankel分级评价神经功能恢复情况。结果:26例患者手术时间120~175 min,平均155 min;术中出血量800~1 500 ml,平均1 100 ml。术后第2天时Cobb角 $5^{\circ}\sim 15^{\circ}$,平均 $(9.60\pm 2.50)^{\circ}$,较术前明显改善($P<0.05$),改善率76%;VAS评分1~5分,平均 4.00 ± 1.00 ,较术前明显改善($P<0.05$);脊髓功能Frankel分级1例由E级变为C级,其余未有加重情况。术后随访3~24个月,平均16.4个月。末次随访时Cobb角 $5^{\circ}\sim 19^{\circ}$,平均 $(11.00\pm 3.50)^{\circ}$,VAS评分1~6分,平均 (4.40 ± 1.25) 分,术后脊髓功能Frankel分级由E级变为C级1例,恢复至D级,余无加重病例。1例患者术后3个月出现固定节段下位椎体骨折,1例患者术后5个月出现固定节段上位相邻节段椎体骨折,均予对症、抗骨质疏松治疗后胸痛症状缓解;影像学可见植骨融合,未见内固定松动及断裂。结论:经椎弓根截骨矫形术治疗骨质疏松性脊柱陈旧性骨折伴后凸畸形,可以取得良好的临床效果,但需重视术中操作及术后相邻节段椎体骨折的预防。

【关键词】 脊柱后凸; 脊柱骨折; 骨质疏松; 截骨术

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Posterior spinal transpedicular wedge osteotomy for kyphosis due to delayed osteoporotic vertebral fracture in elderly
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ABSTRACT Objective: To evaluate the clinical effects of posterior spinal transpedicular wedge osteotomy for kyphosis due to delayed osteoporotic vertebral fracture in elderly. **Methods:** From July 2009 to February 2014, 26 patients with kyphosis caused by delayed osteoporotic vertebral fracture were treated with transpedicular wedge osteotomy. There were 10 males and 16 females, aged from 55 to 75 years old with an average of 67 years. There were 1 osteotomy in thoracic vertebra, 21 osteotomies in thoracolumbar vertebrae and 4 in lumbar vertebrae. Total 29 vertebrae were involved, 23 cases with single vertebral fracture and 3 cases with double vertebral fractures. Preoperative Cobb angles were $32^{\circ}\sim 51^{\circ}$ with the mean of $(42.00\pm 4.75)^{\circ}$ and VAS scores were 6 to 9 points with an average of (8.40 ± 0.75) points. According to the Frankel grade of spinal cord function, 4 cases were grade D and 22 cases were grade E. Intraoperative bleeding, operation time and perioperative complications were recorded, and improvements of Cobb angle were evaluated by X-rays. VAS score and Frankel grade were respectively used to evaluate the pain and nerve function. **Results:** The average operation time were 155 min (ranged, 120 to 175) and the mean intraoperative bleeding were 1 100 ml (ranged, 800 to 1 500). Postoperative at 2 days, Cobb angle and VAS score were $(9.60\pm 2.50)^{\circ}$ and (4.00 ± 1.00) points, respectively, ranged from 5° to 15° and 1 to 5 points. VAS score and Cobb angle improved obviously compared with preoperative ($P<0.05$), and the improvement rate of Cobb angle was 76%. Frankel grade of 1 case changed from grade E to C, and the others did not become worse. The follow-up period ranged from 3 to 24 months with an average of 16.4 months. At the final follow-up, Cobb angles and VAS score were $(11.00\pm 3.50)^{\circ}$ and (4.40 ± 1.25) points, respectively, ranged from 5° to 19° and 1 to 6 points. The patient whose Frankel grade E changed to C at 2 days after surgery and changed to grade D at the latest follow-up. Vertebral body fracture below the fusion level happened in 1 case at 3 months after surgery, vertebral body fracture above the fusion level happened in 1 case at 5 months after surgery, and their chest pain symp-

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toms were relieved after symptomatic treatment and anti osteoporosis treatment. All osteotomy levels obtained fusion which confirmed by X-ray and no internal fixation loosening and breakage were found. **Conclusion:** The clinical effect of posterior transpedicular wedge osteotomy for kyphosis due to delayed osteoporotic vertebral fracture was satisfactory, but manipulation during the operation should be cautious and prevent adjacent vertebral body fracture should be pay attention to prevent.

KEYWORDS Kyphosis; Spinal fractures; Osteoporosis; Osteotomy

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骨质疏松性陈旧性脊柱骨折伴后凸畸形常出现腰背部疼痛和神经功能障碍,严重影响患者的日常生活。保守疗法使部分患者长期卧床而出现肺部、泌尿系感染等严重并发症而死亡,5年病死率高达23%~34%^[1]。常规脊柱内固定难以获取良好的复位及固定效果。经皮椎体成形术难以经椎弓根到达伤椎前、中柱,无法建立有效的穿刺通道,亦无法进行有效的矫形^[2]。因此,老年骨质疏松性陈旧性胸腰段骨折伴后凸畸形已成为目前脊柱外科的难题之一。笔者自2009年7月至2014年2月采用后路经椎弓根截骨矫形治疗骨质疏松性陈旧性脊柱骨折伴后凸畸形26例,取得良好效果,现报告如下。

1 资料与方法

1.1 一般资料

本组26例,男10例,女16例;年龄55~75岁,平均67岁;均为陈旧性骨质疏松性脊柱骨折(>6个月)并伴有后凸畸形,经过严格保守治疗3个月无效,包括应用非甾体类消炎镇痛药物,抗骨质疏松药物等。其中胸椎1例,胸腰椎21例,腰椎4例;共29个椎体骨折,双椎体骨折3例,单椎体骨折23例;术前后凸Cobb角为32°~51°,平均(42.00±4.75)°。VAS评分6~9分,平均8.40±0.75。脊髓功能Frankel分级:D级4例,E级22例。

1.2 治疗方法

1.2.1 手术方法 气管插管全麻,术中脊髓监护,取俯卧位,后正中切口,根据术前融合固定范围确定切口长度,切开皮肤、皮下组织及深筋膜,沿棘突两侧切开并剥离竖脊肌,用自动牵开器将肌肉向两侧牵开,侧方显露到横突外缘,显露畸形脊柱后部结构全段。于截骨远近端分别安置椎弓根钉2~3组,临时固定一侧,行对侧经椎弓根部位截骨,在椎弓根水平用弧形骨凿横行截断骨折椎体后方皮质。用刮匙和髓核钳取出椎体内松质骨。同法再进行另一侧截骨,直至前方椎体至贯通,然后用脊柱截骨反推器将椎体后壁残留部分切除。安置双侧连接棒并纵向压缩至上下方终板骨质闭合,后凸矫正。在此过程中必须反复检查硬膜边缘有无压迫,脊髓有无明显褶皱。最后做后外侧植骨融合。常规放置引流后关闭切口。手术过程中常规进行控制性低血压以减少出血。术中在截骨前常规使用甲基强的松龙40 mg 静脉滴注。

1.2.2 术后处理 术后应用抗生素3~5 d,伤口负压引流48 h,13~15 d拆线出院,2周后佩戴保护支具下床,支具保护3个月。并继续应用抗骨质疏松药物;指导腰背肌和下肢功能锻炼等。

1.3 观察项目与方法

记录术中出血量、手术时间及围手术期并发症等一般情况;手术前后根据影像学资料测量后凸Cobb角,矫形效果采用矫正率评估,矫正率=[(矫正前Cobb角-矫正后Cobb角)/矫正前Cobb角]×100%;应用VAS评分评价疼痛缓解情况;应用Frankel分级评价神经功能恢复情况。

1.4 统计学处理

采用SPSS 13.0统计软件,计量资料以均数±标准差($\bar{x} \pm s$)表示,采用 t 检验对患者术前、术后和末次随访时的后凸Cobb角等进行统计分析,以 $P < 0.05$ 为差异有统计学意义。

2 结果

本组手术时间120~175 min,平均155 min;术中出血量800~1 500 ml,平均1 100 ml。术后2 d时Cobb角5°~15°,平均(9.60±2.50)°,较术前明显改善($P < 0.05$),见表1,改善率76%;术后第2天VAS评分1~5分,平均4.00±1.00,较术前明显改善($P < 0.05$)。脊髓功能Frankel分级1例由E级变为C级,其余未有加重情况。术后随访3~24个月,平均16.4个月。末次随访时Cobb角5°~19°,平均(11.00±3.50)°,VAS评分1~6分,平均4.40±1.25,术后脊髓功能Frankel分级由E级变为C级的1例,恢复至D级,余无加重病例(表2)。1例患者术后3个月出现固定节段下位椎体骨折,1例患者术后5个月出现固定节段上位相邻节段椎体骨折,均予对症、抗骨质疏松治疗后胸背痛症状缓解;影像学可见植骨融合,未见内固定松动及断裂。典型病例见图1。

3 讨论

3.1 经椎弓根截骨治疗骨质疏松性脊柱陈旧性骨折伴后凸畸形的目的及意义

随着老龄人口的增加,骨质疏松性椎体压缩骨折的发生率日趋增加。对不伴有后凸畸形的患者,如椎体压缩骨折是新鲜的,不伴有脊髓和神经根压迫症状,大部分患者经抗骨质疏松、椎体成形术及传统的常规切开复位内固定可达到良好的治疗效果,然



图 1 女性患者,67 岁,骨质疏松性胸腰段陈旧性骨折伴后凸畸形 (T₁₂L₁) 1a. 术前侧位 X 线片示 T₁₂L₁ 椎体陈旧性骨折伴胸腰椎后凸畸形 1b. 经椎弓根截骨术后第 2 天侧位 X 线片示胸腰段后凸畸形矫正满意 1c,1d. 术中截骨完成情况

Fig.1 A 67-year-old female patient with kyphosis due to delayed osteoporotic vertebral fracture in T₁₂L₁ 1a. Preoperative lateral X-ray showed the old fracture with thoracolumbar kyphosis 1b. Lateral X-ray showed the satisfactory outcome at the 2nd day after transpedicular osteotomy 1c,1d. The picture of osteotomy finish during surgery

表 1 骨质疏松性陈旧性脊柱骨折伴后凸畸形 26 例患者手术前后的 Cobb 角和 VAS 评分 ($\bar{x} \pm s$)

Tab.1 Cobb angle and VAS of 26 patients with kyphosis due to delayed osteoporotic vertebral fracture before and after surgery ($\bar{x} \pm s$)

时间	Cobb 角(°)	VAS 评分(分)
术前	42.00±4.75	8.40±0.75
术后 2 d	9.60±2.50 ^①	4.00±1.00 ^{②③}
末次随访	11.00±3.50 ^④	4.40±1.25 ^⑤

注:与术前比较,① $t=30.78, P<0.01$;② $t=1.66, P=0.1$;③ $t=17.75, P<0.01$;④ $t=1.27, P=0.2$

Note: Compared with preoperative data, ① $t=30.78, P<0.01$; ② $t=1.66, P=0.1$; ③ $t=17.75, P<0.01$; ④ $t=1.27, P=0.2$

表 2 骨质疏松性陈旧性脊柱骨折伴后凸畸形 26 例患者手术前后的 Frankel 分级 (例)

Tab.2 Results of Frankel grade of 26 patients with kyphosis due to delayed osteoporotic vertebral fracture before and after surgery (case)

Frankel 分级	术前	术后 2 d	末次随访
C 级	0	1	0
D 级	4	2	3
E 级	22	23	23

而,对于伴有后凸畸形的陈旧性骨折,常出现持久性的腰背痛,部分伴有迟发性神经症状,严重影响患者的日常生活,如何对其进行有效的治疗是目前脊柱外科的难题之一。自 2008 年,Saita 等^[3]采用后柱缩短截骨治疗骨质疏松性重度椎体压缩骨折取得了良好的治疗效果,为骨质疏松性陈旧性骨折伴后凸畸形者的治疗提供了良好的治疗思路。通过后路截骨

在减压同时可重新建立脊柱矢状面的平衡,有效缓解腰背部疼痛,后路截骨方式较多,主要有 SPO 截骨、经椎弓根截骨、全脊柱截骨等。SPO 截骨通过腰椎附件的“V”形截骨和前柱的张开来完成矫正^[4],可矫正角度仅约为 10°。然而,老年患者关节突关节及关节囊多增生、硬化致脊柱僵硬,故 Petersen 截骨矫正难以到达满意矫正效果,且不能进行椎管的直接减压^[5]。全椎体切除术较适合于重度后凸畸形,手术操作复杂,出血多,创伤较大,针对老年人来说需慎重选择。陈旧性脊柱后凸 Cobb 角多为轻中度畸形,经椎弓根截骨可进行 40°左右的截骨,故既可满足矫正,又具有出血少、创伤小、操作简单等优点,笔者的方法主要为经椎弓根进行截骨。

3.2 手术适应证的选择

虽然适应证存在较大争论。Ataka 等^[6]认为后凸畸形或伴有进行性神经损害,局部后凸 Cobb 角大于 30°并伴有长期疼痛患者应手术治疗。李超等^[7]认为手术指证为:(1)椎体高度压缩>75%,椎体失去支撑功能,导致前纵韧带松弛,在顶椎区域形成假关节样现象,引起顶椎区域疼痛;(2)后凸不断发展,脊髓慢性受压,引起组织学改变等。然而,有研究表明^[8]轻度矢状面失衡即可引起该类患者生活质量的明显改变,且失衡程度与生活质量的恶化程度呈正相关,在本组病例中有 3 例患者术前虽然 Cobb 角 ≤30°,然而,患者存在持久性疼痛,经各种保守治疗后无缓解,后经截骨后症状缓解,故笔者认为,Cobb 角大小不应作为一个绝对的指标,还应考虑矢状面的整体与局部平衡问题及患者主观症状和查体情况。

3.3 手术中注意事项

3.3.1 置钉问题 该类患者一般存在不同程度的

骨质疏松,故应保证一次置钉成功,避免反复钻孔造成钉道松弛;若出现一次置钉失败,可于钉道内植松质骨,重新置钉,并加强钉道周围的植骨,或者选择相对粗的椎弓根螺钉,增加螺钉的抗拔出,有可能可选择双皮质固定。有文献报道^[7]可在钉道内注入骨水泥以强化螺钉的把持力,但有众多学者表示反对^[9],认为注入骨水泥有造成脊髓神经损伤的风险,远期疗效亦不能肯定,所以本组 26 例病例并没有采用这样的方法,然而术后未见有内固定松动断裂的情况。

3.3.2 脊髓问题 首先于双侧侧方贯通椎体后,一侧临时棒固定的前提下,特制刮匙小心刮除椎体内松质骨,对于不能确认是否达到椎体前方时,可于术中透视,避免损伤前方组织。因椎体后壁紧贴脊髓,尤其有畸形存在的情况下,脊髓在顶椎部位成角,故在处理时更需小心,需应用微型磨钻去除邻近骨质,使后壁薄层悬浮后,脊柱截骨反推器将其切除,或使用髓核钳仔细咬除。并且全程必须在脊髓监护下进行,不仅可以通过体感诱发电位监测脊髓功能,还可以适时地采用唤醒试验进行。

3.3.3 截骨问题 截骨前最好先用 C 形臂 X 线透视,把握好截骨的角度,刮匙操作时要用力均匀,用大小不同的刮匙交替操作,如果椎体前柱压缩严重,则尽量把截骨范围控制在中后柱。本组 1 例术中截骨过程中,由于刮匙角度问题,不幸打击到脊髓,术中诱发电位即提示异常,唤醒试验后发现双下肢肌力下降,脊髓功能 Frankel 分级 1 例由 E 级变为 C 级,至 6 个月后随访恢复至 D 级,故在截骨过程中切忌粗暴操作,应有条不紊,把握好每次刮匙的角度及力量。

3.3.4 截骨后闭合问题 应保证:一方面脊髓不能受到牵拉与皱褶,Berven 等^[10]报道 13 例截骨术中 4 例(30.8%)发生下肢麻痹,术后半年才恢复。Gertzbein 等^[11]认为后路截骨矫正超过 40° 将造成脊髓短缩、迂曲和堆积。另一方面需达到远近端椎管的各个方向的同心圆对合,同时需提醒台下密切监测诱发电位,若出现异常,重新调整闭合过程。

3.3.5 固定节段问题 固定节段的选择尚无统一标准。既往研究表明^[12]成人脊柱畸形患者的健康相关生活质量(healthrelated quality of life, HRQOL)与其冠状面畸形关系不大,而与其矢状面畸形密切相关。最新研究^[13]证实,成人脊柱畸形患者术后即便获得极佳的冠状面矫形,若患者术后仍存在矢状面失衡,则依然会导致其出现疼痛症状及功能丧失等,进而严重影响患者的生活质量。因此固定节段的选择,以恢复脊柱整体及局部矢状面平衡为原则,由于骨

质疏松患者的多为老年人,内固定节段过短易导致失败,而内固定较长则可导致较多脊柱运动单元的丧失,应根据患者具体的骨质情况选择固定节段,对于骨质较好者,可于病椎上下各两个椎体固定,对于骨质疏松严重者,可适当延长固定节段。本组 21 例选用上下各 2 个椎体固定,5 例选用上下 3~4 个椎体固定,随访均取得良好的治疗效果。

3.4 术后问题

术前后严格按照中华医学会骨质疏松症治疗的指导原则用药,重视内科治疗原发病是保证手术成功的关键因素之一。

总之,经椎弓根截骨矫形术治疗骨质疏松性脊柱陈旧性骨折伴后凸畸形作为一种治疗方法,可以取得良好的临床效果,但仍需重视术中操作及术后相邻节段椎体骨折的预防。

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·经验交流·

闭合复位内固定联合外固定架治疗不稳定骨盆骨折

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【摘要】目的:探讨经皮螺钉内固定联合外固定架治疗不稳定骨盆骨折的临床效果。方法:自2006年4月至2009年5月,采用闭合复位内固定联合外固定架治疗29例旋转不稳定型骨盆骨折患者,男19例,女10例;年龄19~53岁,平均31岁。按照Tile分型:C1型17例,C2型12例。术后采用Tornetta标准和Majeed功能评分进行疗效评价。结果:29例患者均获随访,时间10~24个月,平均16个月。术后无神经损伤及盆腔脏器损伤等并发症发生,伤口愈合好,仅1例出现钉道口感染,换药后治愈。骨折均获骨性愈合,愈合时间为14~18周,平均16.2周。未见螺钉松动、脱出、断裂。按照Tornetta评价,优14例,良10例,可4例,差1例。末次随访Majeed评分为 87.2 ± 11.3 ,优16例,良9例,可4例。结论:对于不稳定C1、C2型骨盆骨折,采用闭合复位内固定联合外固定架可以取得满意的治疗效果。

【关键词】 骨盆; 骨折; 骨折固定术,内; 外固定器

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Application of internal fixation combined with external fixator for unstable pelvic fracture GAO Jin-hua, HU Wei, and GUO Xiao-shan*. *Department of Orthopaedics and Trauma, the Second Affiliated Hospital of Wenzhou Medical University, Wenzhou 325000, Zhejiang, China

ABSTRACT Objective: To investigate the clinical effects of percutaneous closed reduction and cannulated screw internal fixation combined with external fixation in the treatment of unstable pelvic fractures. **Methods:** From April 2006 to May 2009, 29 patients with pelvic fractures of rotatory instability were treated with closed reduction and screw internal fixation combined with external fixation. There were 19 males and 10 females with an average age of 31 years old (ranged from 19 to 53 years). Based on the Tile classification, 17 cases were type C1 and 12 case were type C2. Tornetta standard and Majeed score were used to evaluated the clinical effect after operation. **Results:** All patients were followed up from 10 to 24 months with an average of 16 months. There were no nerve injuries and other organ injuries, only one case of infection was found and it was cured with wound dressing. Time of fracture union was from 14 to 18 weeks with the mean of 16.2 weeks. No loosening, slippage or breakage of the screw were found. According to the Tornetta standards, 14 cases obtained excellent results, 10 good, 4 fair and 1 poor. The Majeed score was 87.2 ± 11.3 , 16 cases got excellent results, 9 good and 4 fair. **Conclusion:** Closed reduction and screw internal fixation combined with external fixation is an effective way to treat unstable pelvic fractures with Tile type C1 and Tile type C2.

KEYWORDS Pelvis; Fractures; Fracture fixation, internal; External fixators

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