

对 MRI 检查评定肌肉的损伤与恢复情况的方法还需进一步探索。

对比开放手术, MIS-TLIF 手术避免了对椎旁肌肉的剥离, 当扩张器撑开肌间隙时, 是沿肌纤维方向纵行逐渐分离的, 且牵拉的力量均匀分布于撑开器周围, 减少了肌肉的异常负荷和其他软组织结构的损伤, 最大程度保留了椎旁软组织的生理机能。微创手术也能有效保护多裂肌内侧背支的神经起点, 而在传统的开放手术中, 此神经在剥离过程中极易损伤, 从而导致肌肉的失神经化。

在早期的文献报道中微创手术的时间较长, 在本研究中手术时间两组无统计学差异, 分析可能缘于下列因素: (1) 微创手术作为一项新的技术, 存在学习曲线, 早期进行的病例手术操作时间较长, 而同期进行对比的开放手术已积累丰富的手术经验。(2) 微创组术中需要更多的透视时间, 本组病例中因受限于操作 C 型臂的客观因素无法精确统计, 因此没有分析此项的统计学差异, 但手术中微创组透视的次数明显多于开放手术组。(3) 微创手术过程包括安装工作通道的时间。(4) 虽然微创组手术医生要经过一定的学习曲线, 但同时开放手术的经验积累、手术技巧的总结也为进行微创手术奠定了良好的基础。

综上, 我们通过前瞻性的随机对照研究, 综合分析多项指标, 证实微创经椎间孔减压腰椎融合内固定手术治疗腰椎退变性疾病能有效减少术中出血量、术后引流量、缩短住院时间, 软组织损伤小, 有助于早期功能恢复, 并能取得与传统开放手术同样的临床恢复结果。但本研究未能取得连续病例, 样本量相对较小, 也未能实现盲法操作, 因此可能存在测量偏倚, MRI 肌肉损伤的评价方法还有待探索改进。

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(收稿日期: 2012-11-27 修回日期: 2013-01-18)

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(本文编辑 李伟霞)

症状性椎体血管瘤影像学表现及手术治疗

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【摘要】目的:探讨症状性椎体血管瘤的影像学表现、手术治疗方法及疗效。**方法:**回顾 2006 年 5 月~2012 年 5 月收治的 17 例椎体血管瘤病例,其中男 5 例,女 12 例,年龄 27~68 岁,平均 47.1 岁。累及椎体共计 18 个节段,胸椎 7 个节段,腰椎 11 个节段。临床症状主要以疼痛为主,占 77.8%(13/17);伴随神经损害者占 22.2%(4/17),Frankel 分级 2 例 C 级,2 例 D 级;病程 8~36 个月。影像学上病灶局限于椎体内且仅有疼痛症状者 13 例,单纯行椎体成形术;呈膨胀性生长合并根性症状者 2 例,行椎板切除减压辅以术中椎体成形术;累及全椎体伴随严重脊髓压迫者 2 例,行全椎体切除重建,在行椎体切除之前对所切椎体均行椎体成形处理。应用 VAS 评分及 SF-36 量表评价患者疼痛及生活质量,随访观察治疗效果。**结果:**本组平均手术时间 95min,术中平均失血量 265ml,术后 2 周内下地自主活动,病理证实海绵状血管瘤 15 例,毛细血管瘤 2 例。所有病例均得到随访,随访时间 4~60 个月,平均 28.2 个月,术后疼痛症状均得到有效缓解,无需额外服用镇痛药物,术前 VAS 及 SF-36 评分分别为 7.6 ± 1.3 分和 45.2 ± 5.4 分,末次随访时分别为 1.4 ± 0.8 分和 89.3 ± 7.2 分,与术前比较均有显著性差异($P < 0.05$)。2 例术前 Frankel C 级患者及 2 例 D 级患者于术后神经功能均恢复至 Frankel E 级,平均恢复时间 5.4 个月。影像学随访未发现肿瘤复发、假关节形成或内固定移位松动。**结论:**对于不同症状和影像学表现的症状性椎体血管瘤,采取不同的手术方式可以取得良好的效果,椎体成形术可以单独使用也可以联合其他术式治疗症状性椎体血管瘤,效果良好。

【关键词】椎体血管瘤;椎体成形术;手术治疗

doi:10.3969/j.issn.1004-406X.2013.03.11

中图分类号:R738.1 文献标识码:A 文章编号:1004-406X(2013)-03-0251-06

Imaging appearance and surgical management for symptomatic vertebral hemangioma/SHEN Bin, MENG Yang, ZHAO Weidong, et al//Chinese Journal of Spine and Spinal Cord, 2013, 23(3): 251-256

【Abstract】 Objectives: To investigate the imaging appearance, surgical management and the outcome for symptomatic vertebral hemangioma. **Methods:** 17 cases(5 males and 12 females) suffering from symptomatic vertebral hemangioma with an average age of 47.1 years(range, 27-68 years) were observed from May 2006 to May 2012. There were 18 vertebrae involved in this group. 7 cases had defect sited in thoracic and 11 in lumbar. Pain was the major complain of these cases(77.8%, 13/17), 4 cases had neurological deficit(22.2%) which included 2 Frankel C and 2 Frankel D. The disease course in this group was 8 months to 36 months. Cases suffering from pain and having defect locating in vertebral body(13 cases) underwent percutaneous vertebroplasty(PVP), while those with radiculopathy and having defect penetrating the vertebral wall(2 cases) underwent laminectomy plus intraoperative vertebroplasty, vertebrectomy and reconstruction combined with intraoperative vertebroplasty was performed on aggressive cases with circumferential compression and posterior elements involved (2 cases). The VAS scale and SF-36 scale were applied in patients for evaluating pain and quality of life at follow-up. **Results:** The mean operation time and blood loss was 95min and 265ml respectively. All patients started to walk within 2 weeks after surgery. Pathological finding confirmed 15 cavernous hemangiomas and 2 capillary hemangiomas. The mean follow-up was 28.2 months(range, 4-60 months). All cases got satisfied pain relief and could live free of analgesics. There was significant difference in postoperative VAS and SF-36(1.4 ± 0.8 and 89.3 ± 7.2) compared with preoperative ones(7.6 ± 1.3 and 45.2 ± 5.4). 4 patients with neurological deficit got good recovery from Frankel C or D to Frankel E, with a mean recovery time of

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5.4 months. No recurrence, instrument failure, and pseudarthrosis were observed in this group. **Conclusions:** The surgical management and its outcome of symptomatic vertebral hemangioma depend on the imaging finding and clinical symptom, which can be managed by vertebroplasty alone or combination with other intervention.

【Key words】 Vertebral hemangioma; Vertebroplasty; Surgical treatment

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椎体血管瘤是常见的良性脊柱肿瘤,其发生率约为 10%~12%,好发于胸椎,其次为颈腰椎^[1,2]。大多数椎体血管瘤没有临床症状,多由影像学偶然发现而得以诊断。1%~2%的椎体血管瘤病例可发生临床症状,称为症状性椎体血管瘤(symptomatic vertebral hemangioma, SVH)。笔者回顾了 2006 年 5 月~2012 年 5 月我院手术治疗的 17 例 SVH 病例,总结如下。

1 资料和方法

1.1 一般资料

本组男 5 例,女 12 例,年龄 27~68 岁,平均 47.1 岁。累及椎体共计 18 个节段,其中累及胸椎 7 个节段(T4 2 个,T8 1 个,T10 1 个,T11 2 个,T12 1 个),腰椎 11 个节段(L1 3 个,L2 2 个,L3 3 个,L4 2 个,L5 1 个,1 例同时累及 L1 和 L3)。临床症状主要以疼痛为主不伴神经损害者占 77.8%(13/17);伴随神经损害者占 22.2%(4/17),其中 2 例发生于胸段(T8 1 例 Frankel C 级,T12 1 例 Frankel D 级),2 例发生于腰段(L2 1 例 Frankel D 级,同时累及 L1 和 L3 1 例 Frankel C 级)。病程 8~36 个月,平均 16.5 个月。

1.2 影像学表现

所有患者术前均行 X 线、CT 和 MRI 检查,影像学均具有典型的“栅栏样”或“蜂巢样”椎体表现。本组以椎体后缘及椎弓后缘为界,参考 Tomita 分型^[3]及 Urrutia 等^[4]的研究,根据其术前 MRI 上侵袭范围的不同将其分为以下 3 类(图 1):a 类,病灶局限于椎体内,不超出椎体后缘水平,本组 13 例;b 类,病灶超出椎体后缘累及椎弓但未超出椎弓,后侧椎板、棘突未被累及,病灶可部分突入椎管压迫神经结构,此类中也包括椎体呈膨胀性生长,新生物超出原有椎体后缘突入椎管而椎管椎弓完整的情况,此类中新生物多具有特征性的“双叶草样”结构,本组 2 例;c 类,病灶进一步超出椎弓后缘,累及后侧结构乃至全椎体,椎管极度

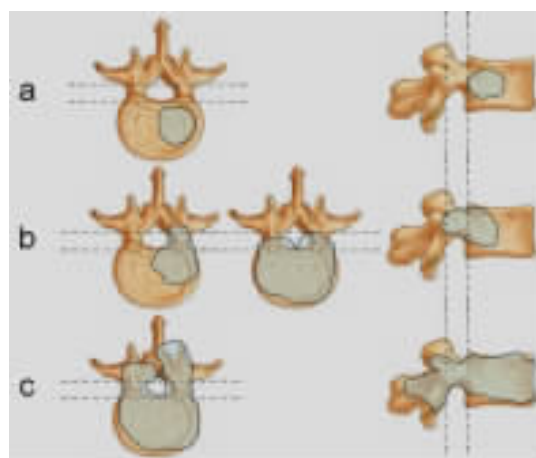


图 1 本组术前影像学分类(以椎体后缘及椎弓后缘为界分为三类,a 类,病灶局限于椎体内,不超出椎体后缘水平;b 类,病灶超出椎体后缘累及椎弓但未超出椎弓,后侧椎板、棘突未被累及;c 类,病灶进一步超出椎弓后缘,累及后侧结构乃至全椎体)

Figure 1 Classification of preoperative imaging in this surgical group. Posterior border of the vertebral body and pedicle were determined as anatomical marks for classification in this group. Type a was defined as lesion limited in the body and not over the posterior border of vertebral body. Type b was defined as the pedicle erosion by overgrew SVH but posterior elements like spinous process and lamina were not involved. Type c was defined as posterior elements erosion so as the body and pedicle even whole vertebra was involved.

狭窄,表现为 360°受压,本组 2 例。

1.3 手术方法

根据病例影像学表现的不同,采用不同的手术方式。a 类的患者,均行经皮椎体成形术(percutaneous vertebroplasty, PVP)治疗,术中患者取俯卧位,穿刺套件经皮在 C 型臂 X 线机监视下通过双侧病椎椎弓根置入工作管道,选用球囊扩张后,于“拉丝期”经工作套管注入骨水泥(平均每个椎体约 5ml 左右),注入过程在透视监视下完成,待水泥固化后拔出工作套管结束手术。b 类患者,

取俯卧位,术中首先经双侧病椎椎弓根置入工作套管,注入骨水泥,待固化后行充分椎板切除减压,探查神经根管尤其是侧隐窝区域,最后行内固定及后侧融合,放置引流后结束手术。c类患者,减压范围包括椎管的360°方向,先经后路行椎体成形术以减少椎体切除术中的失血并行后方椎板及椎弓切除扩大椎管,行Enbloc技术或前路入路切除椎体并重建。

此外,b类及c类患者行选择性椎体栓塞处理,观察1~2d后再行减压手术。

1.4 评估及统计方法

以视觉模拟评分法(VAS)及健康调查评分量表(SF-36)评估疼痛和生活质量,取均值行术前、术后及末次随访对照,所有数据均以SPSS 19.0进行统计学分析,数据比较采用配对 t 检验,以 $P<0.05$ 表示有统计学意义。所有患者随访时均行常规X线、CT及MRI检查以判断有无邻近节段椎体骨折、内固定松动及假关节形成等情况发生。

2 结果

本组平均手术时间95min(a类平均35min,b类平均210min,c类平均350min),术中失血平均265ml(a类平均45ml,b类平均610ml,c类平均1350ml),手术失血主要集中在b类和c类患者中,其手术时间较a类患者亦显著延长。a类患者均可于术后第1天即下地自主活动,b、c类患者于术后7~14d支具保护下下地活动。本组病例入

院期间均未见严重并发症,行椎体成形病例术中及术后摄片亦未出现骨水泥漏出或血流动力学不稳等情况,所有患者均顺利康复出院。所有病例最终诊断均由病理得以确认,其中海绵状血管瘤15例,毛细血管瘤2例。

本组随访时间4~60个月,平均28.2个月。手术后患者疼痛症状均有不同程度的减轻,无需额外服用镇痛药物,其术前VAS评分及SF-36评分对照术后及末次随访时存在统计学差异($P<0.05$,表1)。术前2例Frankel C级及2例D级患者术后均恢复至E级,平均恢复时间5.4个月(2.6~9.0个月)。随访尚未见肿瘤复发病例,影像学亦未见椎体邻近节段椎体骨折、内固定松动移位、假关节形成等情况发生(图2~4)。

表1 患者术前术后VAS及SF-36评分结果

Table 1 The VAS and SF-36 outcome in this group

	术前 Pre-op	术后 Post-op	末次随访 Final follow up
VAS	7.6±1.3	2.4±0.9 ^①	1.4±0.8 ^①
SF-36	45.2±5.4	78.4±9.5 ^①	89.3±7.2 ^①

注:①与术前比较 $P<0.05$

Note: Compared with preoperation, $P<0.05$

3 讨论

3.1 影像学诊断

椎体血管瘤的诊断主要依靠影像学,其X线及CT多有典型的“栅栏样”和“蜂巢样”椎体改变,MRI是临床最常用的无创检查,通常情况下

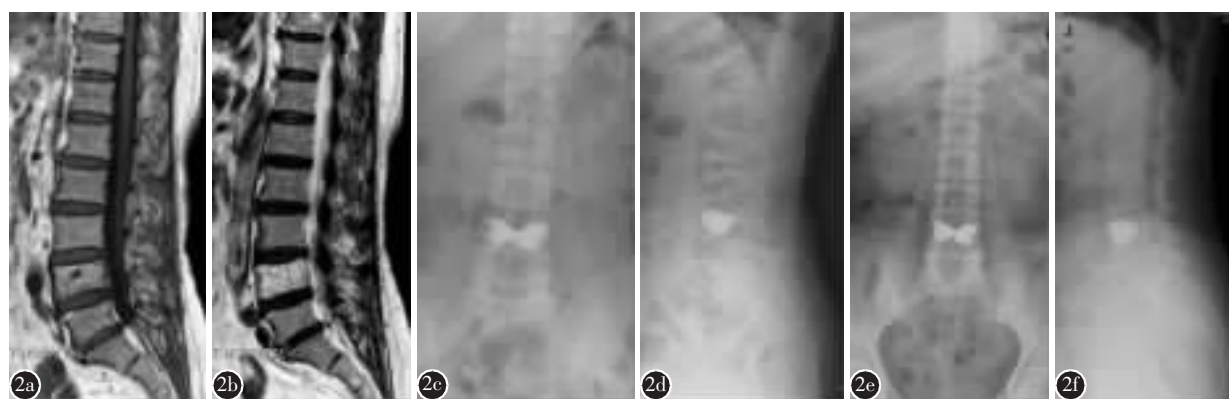


图2 a类病例(65岁女性患者,仅有腰痛症状) a,b 术前MRI示病灶局限于L4椎体内,T1加权为中等信号,T2加权为高信号 c,d 经病椎双侧椎弓根行PVP术后正侧位X线片示骨水泥充盈良好,无渗漏 e,f 术后8个月随访X线片示椎体无塌陷,邻近节段未见骨折及退变

Figure 2 Typical case in group a (a 65-year-old female suffered from low back pain) a, b MRI imaging showed a limited lesion in L4 vertebral body with a middle intensity signal in T1-weighted image and a high intensity signal in T2-weighted image c, d Cement was fully infused with no leakage in postoperative X-ray after bilaterally PVP e, f There was no appearance of collapse and adjacent segment degeneration in 8 months follow up X-ray

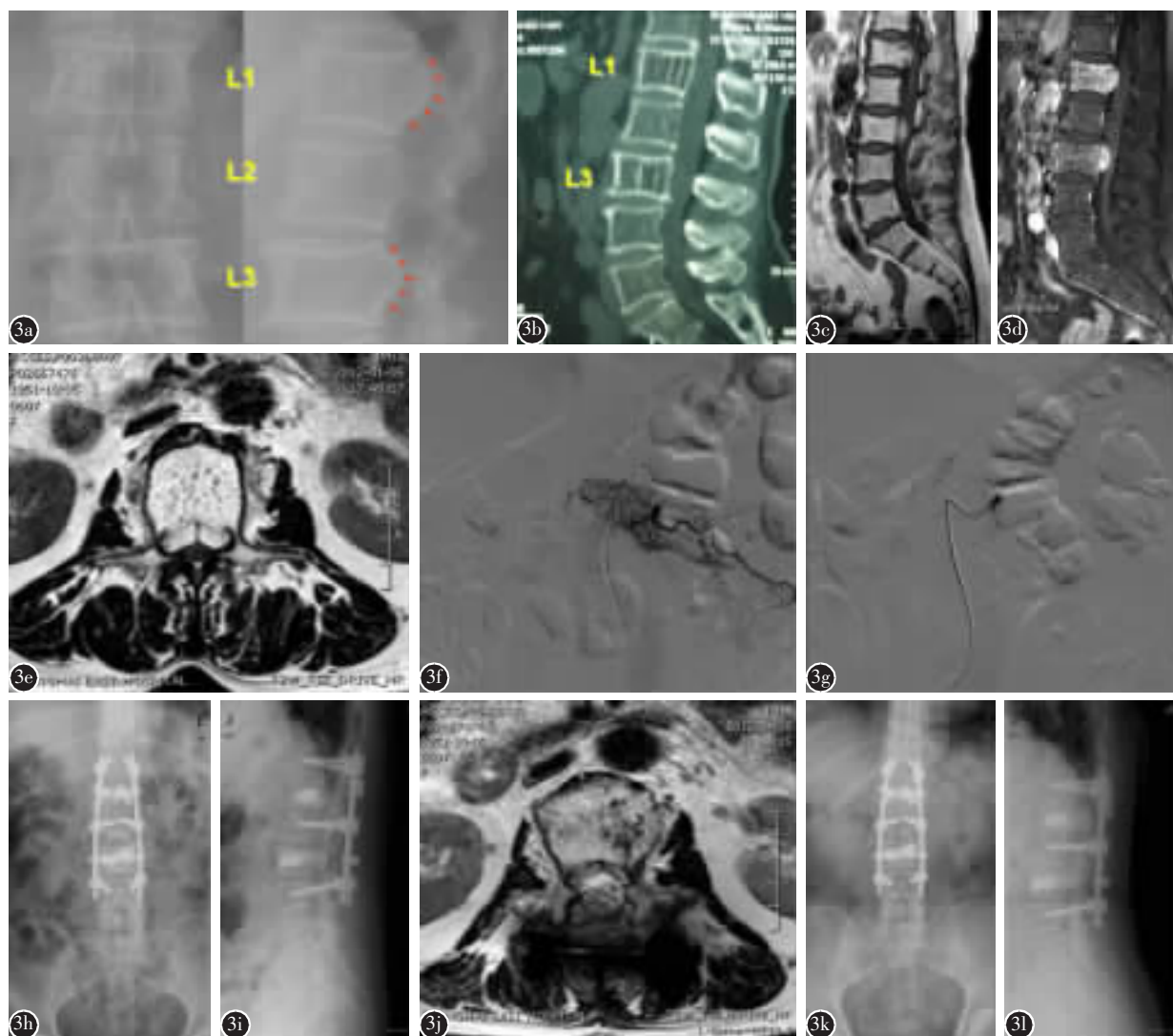


图 3 b 类病例 (60 岁女性患者, 腰痛伴双下肢乏力、排尿障碍) **a** 术前正侧位 X 线片示 L1 和 L3 椎体膨胀性生长, 椎体后缘可见一弧形影 **b** 矢状位 CT 重建可见典型的“栅栏样”改变 **c-e** 术前 MRI 示膨胀区域突入椎管内形成压迫, 呈“双叶草样”改变并可以被造影剂增强 **f, g** 选择性椎体造影可见造影剂显著充盈椎体, 行供应动脉栓塞后则无显影 **h, i** 行椎板切除减压并辅以术中椎体成形术后 X 线片示内固定位置确切 **j** 术后 3 个月随访 MRI 示椎管减压充分 **k, l** 术后 6 个月正侧位 X 线片示邻近椎体无骨折, 终板无塌陷, 病变椎体未见复发

Figure 3 Typical case in group b (60-year-old female with low back pain and weakness in lower extremities combined with bladder dysfunction) **a** A slight curve behind the vertebral body could be seen in the lateral view of X-ray of L1 and L3 expansile vertebral hemangiomas **b** Vertical trabeculations could be identified clearly in the sagittal view of CT **c-e** The characteristic Bilobulated like mass which penetrated into the spinal canal and compressed the dural sac from an axial view of MRI **f, g** Selected angiogram demonstrated the contrast media filling the body while absent after embolization to the supply arteries **h, i** X-ray after laminectomy combined with intraoperative vertebroplasty revealed the instrumentation is in the right position **j** The 3 months follow up MRI demonstrated the decompression to the canal was sufficient **k, l** There was no vertebral fracture, endplate collapse or recurrence in 6 months post-operative imaging finding

T1 加权上呈现中等信号或低信号, 而 T2 加权上为高信号^[4], 有学者同时提出症状性与非症状性椎体血管瘤在 T1 和 T2 加权影像上存在一定差异^[5]。对于少数呈膨胀性生长的 SVH, 横断位 MRI

上其向椎管内的突出物也有特征性的“双叶草样”表现, 可被造影剂增强。对于强烈怀疑为血管瘤的病例, 另可行选择性椎体造影进行诊断, 如造影剂即刻充盈并使椎体显影即可诊断为椎体血管瘤,

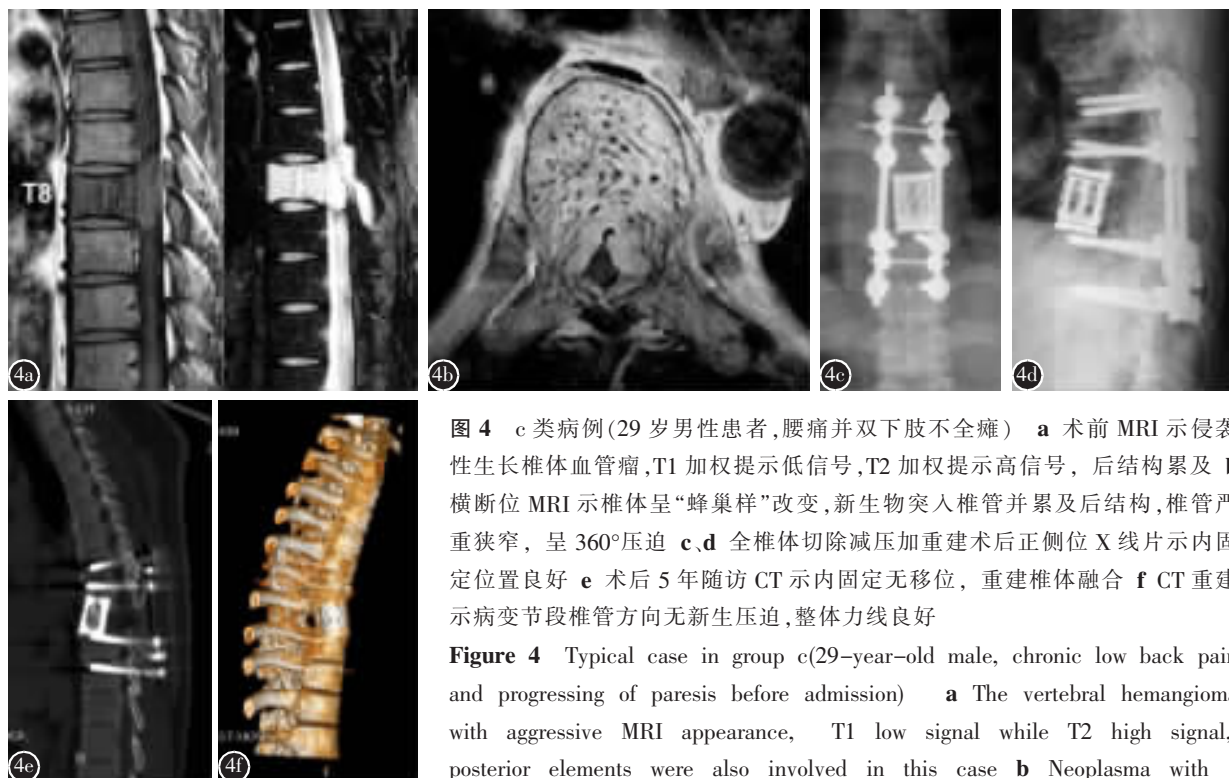


图 4 c 类病例 (29 岁男性患者, 腰痛并双下肢不全瘫) a 术前 MRI 示侵袭性生长椎体血管瘤, T1 加权提示低信号, T2 加权提示高信号, 后结构累及 b 横断位 MRI 示椎体呈“蜂巢样”改变, 新生物突入椎管并累及后结构, 椎管严重狭窄, 呈 360°压迫 c、d 全椎体切除减压加重建术后正侧位 X 线片示内固定位置良好 e 术后 5 年随访 CT 示内固定无移位, 重建椎体融合 f CT 重建示病变节段椎管方向无新生压迫, 整体力线良好

Figure 4 Typical case in group c (29-year-old male, chronic low back pain and progressing of paresis before admission) **a** The vertebral hemangioma with aggressive MRI appearance, T1 low signal while T2 high signal, posterior elements were also involved in this case **b** Neoplasm with "honeycomb" appearance in a transverse view of MRI extruded into the spinal canal and compressed the neurological structure severely and circumferentially. **c, d** X-ray after en bloc decompression and reconstruction revealed a well position of implant **e** Instrumental migration was not observed in 5 years follow up CT scan, while fusion of the reconstructed vertebrae was confirmed. **f** The reconstructed 3D view demonstrated the lacking of neoplasm and compression to the spinal canal, so as the good alignment accomplished in previous operation.

必要时可同时行栓塞处理以利减少术中出血。

3.2 外科治疗

SVH 多需要进行外科干预, 已报道的治疗方式也较多。对于大多数病例, 病灶局限于椎体内, 椎体后结构及神经结构未被累及, 临床症状仅表现为疼痛 (如本组中 a 类患者), 针对此类病例, 可行的方法包括无水酒精烧灼、放疗、栓塞或椎体成形术等。Heiss 最早应用无水酒精对病灶进行烧灼, 其有效率约为 86%^[6], 但术中可能出现急性血流动力学不稳^[7]。选择性栓塞较少作为一种单独的治疗方式, 多和造影联合应用用于诊断并可有效减少减压手术中的失血, 需要注意的是该过程有可能引起脊髓的缺血或坏死而致严重并发症^[8]。放疗可以单独应用, 但多作为外科手术后的辅助治疗方式, 其有效剂量为 30~40Gy^[9,10], 其有效率较其他方式为低 (61.9%), 仅因为没有侵入性损伤而易被接受。

以上方式由于其并发症较多, 有效率相对较低, 在应用上受到了诸多限制, 目前临床最为常用

的方式为椎体成形术, 应用特殊器械可以完成经皮操作, 该技术在骨质疏松性骨折和椎体肿瘤的治疗上应用最多, 有效率可达到 90% 左右^[11]。本组影像学表现为 a 类的患者应用此项技术后的随访效果满意。骨水泥固化可以即刻对病椎强化预防继发的椎体骨折或塌陷, 固化过程中释放的热量同时可以对病灶进行烧灼并可有效填充血窦显著减少减压过程中或椎体切除过程中的失血, 本组病例术中均行此操作, 平均失血量 265ml, 对比文献后可证实其确实可有效减少失血量^[12]。但其对疼痛缓解的作用机制目前尚不得而知, 可能为填充后椎体内部的压力被有效降低所致。对于 PVP 治疗的并发症也多见诸报道^[13,14], 其治疗 SVH 的远期疗效仍缺乏大宗的报道, 尽管如此, 就本组资料的随访情况来看, 椎体成形仍是安全有效的一种方式, 结果类同于国内外报道^[15,16]。

对于病灶局限于椎体内但呈膨胀性生长的病例 (本组 b 类), 其增生组织可向椎管内突出从而对神经结构产生压迫, 所以多需进行减压处理。由

于后结构完整,其压迫组织均来自于前方,致压物多呈“双叶草”样结构,进而导致侧隐窝狭窄,而中央区域压迫为轻,其压迫多比较局限,故行单纯椎板减压已足够,如确需对前方压迫进行处理的,扩大后侧减压范围后对前方新生物行有限切除即可,或可将其打压至椎体内,也可选择进行椎体切除重建。减压前辅以针对病椎的成形术对于此类病例同样安全有效。

对于影像学呈 c 类表现的病例,大多累及椎弓及后侧结构,神经损害进展迅速,甚至出现不全瘫,急症病例可伴有椎体骨折或压缩,多需尽快处理。由于此类病例神经结构多呈 360° 受压,椎管极度狭窄,多需行类似全椎体切除重建的 360° 减压才能满足要求,单纯后路减压往往减压不充分且需要更高的手术技术,Sakanishi 等^[17]尝试在术中联合应用超声技术对减压范围进行实时判断取得了良好的结果。椎体切除重建同时也可以作为其他方法失败后的补救手术^[18]。控制失血是此类病例手术成败的关键,鉴于术中可能出现的大量出血,术前行选择性椎体栓塞合并术中应用椎体成形术方可有效减少出血,需注意即使联合使用以上技术,病椎的血供仍比正常椎体丰富的多,输血多不可避免。

目前来说,对于症状性血管瘤的治疗尚无相应指南,处理方式也多依赖于医生的临床经验。我们认为对于仅有疼痛,病灶局限椎体而没有神经症状的患者,单纯应用 PVP 可以取得良好的效果,对于病灶呈膨胀性生长但仍局限且伴有轻症神经症状的可行全椎板切除减压辅以术中椎体成形,而对于全椎体累及的重症病例行全椎体切除重建,联合术中椎体成形术及术前栓塞可以获得良好效果。

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(收稿日期:2012-05-20 末次修回日期:2013-02-06)

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(本文编辑 彭向峰)