

doi: 10.13241/j.cnki.pmb.2019.21.016

椎体静脉稀疏区注入骨水泥对 PVP 术中骨水泥渗漏的影响 *

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摘要 目的:探讨椎体静脉稀疏区注入骨水泥对骨质疏松椎体压缩性骨折患者行经皮穿刺椎体成形术(percutaneous vertebroplasty, PVP)术中骨水泥渗漏的影响。**方法:**选择西安交通大学第二附属医院 2014 年 1 月至 2018 年 6 月收治的 61 例骨质疏松椎体压缩性骨折患者,根据骨水泥注入区域的不同,将所有患者分为 A 组(30 例)及 B 组(31 例),A 组骨水泥注入区域为椎体静脉密集区(椎体中 1/3 平面处),B 组骨水泥注入区域为椎体静脉稀疏区(椎体上 1/3 及下 1/3 平面处),对比两组的骨水泥渗漏率,术前、术后 6 个月时的视觉模拟评分(Visual analogue scale, VAS),治疗中的骨水泥用量、椎体高度恢复率及 Cobb 角恢复度数。**结果:**B 组的骨水泥渗漏率及骨水泥用量均明显低于 A 组($P < 0.05$)。两组的 VAS 评分、椎体高度恢复率、Cobb 角恢复情况对比差异无统计学意义($P > 0.05$)。**结论:**与椎体静脉密集区相比,在椎体静脉稀疏区注入骨水泥可显著降低骨质疏松椎体压缩性骨折患者 PVP 术中骨水泥渗漏率,椎体静脉稀疏区可作为 PVP 术中骨水泥注射的一个相对安全区域。

关键词:椎体静脉稀疏区;椎体静脉密集区;骨水泥;PVP 术;骨水泥渗漏

中图分类号:R683.2 **文献标识码:**A **文章编号:**1673-6273(2019)21-4072-04

Effect of Bone Cement Injection into Venous Sparse Area on the Bone Cement Leakage during PVP Operation*

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ABSTRACT Objective: To investigate the effect of bone cement injection on the leakage of bone cement in patients with osteoporotic vertebral compression fractures undergoing percutaneous vertebroplasty (PVP). **Methods:** 61 patients with osteoporotic vertebral compression fractures admitted to the Second Affiliated Hospital of Xi'an Jiaotong University from January 2014 to June 2018 were selected, all patients were divided into group A (30 cases) and group B (31 cases) according to the area of bone cement injection. Group A bone cement injection area is vertebral vein dense area (1/3 plane in vertebral body), group B bone cement injection area is vertebral vein sparse area (vertebrae 1/3 and lower 1/3 plane), comparing the cement leakage rate of the two groups, visual analogue scale (VAS) before and 6 months after surgery, the amount of bone cement used during treatment, Vertebral height recovery rate and Cobb angle recovery. **Results:** The leakage rate of bone cement and the amount of bone cement in the group B was significantly lower than that in the group A ($P < 0.05$). There was no significant difference in VAS score, vertebral height recovery rate and Cobb angle recovery between the two groups ($P > 0.05$). **Conclusion:** Compared with the vertebral vein dense area, the injection of bone cement in the sparse vertebral vein can significantly reduce the rate of cement leakage during PVP in patients with osteoporotic vertebral compression fracture. The venous venous sparse area can be used as PVP intraoperative bone. A relatively safe area for cement injection.

Key words: Vertebral vein sparse area; Vertebral vein dense area; Bone cement; PVP; Bone cement leakage

Chinese Library Classification(CLC): R683.2 **Document code:** A

Article ID: 1673-6273(2019)21-4072-04

* 基金项目:国家自然科学基金项目(81001225);陕西省合作计划项目(S2016YFKW0013)

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(收稿日期:2019-05-07 接受日期:2019-05-28)

前言

目前,我国已步入老龄化社会,胸腰椎骨质疏松椎体压缩性骨折的发生率逐年升高^[1,2]。此类患者多出现疼痛等症状,严重影响患者日常生活^[3]。PVP 是治疗胸腰椎骨质疏松椎体压缩性骨折的主要治疗方法,其对患者的创伤较小,且能增强患者椎体稳定性,使患者术后较早活动,缓解患者疼痛,改善患者生活质量^[4-6],但治疗中发生的骨水泥渗漏已成为困扰医师的主要问题。骨水泥渗漏可能导致患者发生神经综合征、肺栓塞等并发症,甚至危及患者生命。因此,如何减少骨水泥渗漏已成为 PVP 治疗中急需解决的问题^[7-9]。

研究显示^[10]骨水泥渗漏与椎体静脉分布有一定相关性。根据椎体静脉的解剖特点,可将其分为密集区与稀疏区,密集区为椎体中 1/3 平面处,稀疏区为椎体静脉少且管腔较细,位于椎体上 1/3 及下 1/3 平面处^[11]。以往临床对 PVP 手术骨水泥注射区域选择密集区或疏松区研究较少,本研究回顾性分析了骨水泥在不同椎体静脉区域注射时对骨水泥渗漏的影响,以期 PVP 手术选择合适的骨水泥注射区域提供临床参考依据。

1 资料与方法

1.1 病例资料

选择 2014 年 6 月至 2018 年 6 月西安交通大学第二附属医院收治的骨质疏松单椎体压缩骨折需行 PVP 手术者 61 例,包括男 36 例,女 25 例;年龄 61~84 岁,平均年龄为 71.3 ± 6.8 岁;骨折类型:腰椎骨折者 45 例,胸椎骨折者 16 例,患者多仅有轻微外伤史或无明显外伤,临床表现为腰背部胀痛,在行走、坐立时疼痛会有加重,患者的受伤椎体有明显叩痛、压痛,骨质疏松 T 值 ≤ -2.5 ,椎体压缩程度均 $<33\%$,椎体压缩性骨折在 X 线下呈楔形变,且 MRI/CT 显示椎管无狭窄、塌陷,椎体后缘骨质完整。排除标准:全身感染、凝血功能障碍、肾功能不全、严重心、脑、肺功能障碍者及有 PVP 手术禁忌证者。根据骨水泥注射区域的不同,将所有患者范围 A 组(30 例)及 B 组(31 例),A 组于椎体静脉密集区(椎体中 1/3 平面处)注入骨水泥,B 组于椎体静脉疏松区(椎体上 1/3 及下 1/3 平面处)注入骨水泥,两组患者的一般资料对比差异均无统计学意义($P>0.05$)。本研究患者均签订知情同意书且符合伦理委员。

表 1 两组患者一般资料对比

Table 1 Comparison of the general data between the two groups of patients

Groups	n	Gender		Age (years)	Fracture site	
		Male	Female		Lumbar spine	Thoracic
Group A	30	18	12	71.5 ± 6.7	23	7
Group B	31	18	13	71.9 ± 7.1	22	9

1.2 材料与方法

两组椎体成形术所用手术材料包括:工作套管、穿刺针、骨水泥(选择聚甲基丙烯酸甲酯材料)、推注棒及配套设备均购自山东冠龙医疗用品有限公司。

两组患者在常规心电图监护下取俯卧位,在胸腹部下方放置体位垫将腹部悬空,之后采用 2%利多卡因对患者行局部麻醉,在 C 型臂 X 线下确定骨折椎体位置,并对椎体进行穿刺。

A 组患者将穿刺针于定位处逐层推进,直至椎体的上 1/3 或下 1/3 平面处,B 组患者推进至椎体中 1/3 平面处。在 C 型臂 X 线正侧位下对穿刺区域进行确定,确定后拔出穿刺针的针芯,调配骨水泥,在 C 型臂 X 线机观察下,待骨水泥拉丝期时用 5 ml 注射器将骨水泥推注至椎体中,推注时若存在骨水泥静脉渗漏或椎管渗漏,即刻停止注入骨水泥,推注时需不断旋转变换针尖的方向,使骨水泥填充均匀;注射后保持注射器于原位 4 min,待骨水泥基本凝结后缓缓拔出穿刺针,以防骨水泥沿针道渗漏。之后将针眼缝合,术后患者在手术室观察 10 min,待患者生命体征稳定、无下肢活动障碍及皮肤感觉异常后送回病房,术后根据骨密度检查给予抗骨质疏松药物治疗,并给子用药指导。

1.3 观察指标

(1)术后 1 d 行病变椎体 X 线检查,统计对比两组患者的渗漏率^[12];(2)采用疼痛视觉模拟评分量表(VAS)对患者术前、术后 6 个月时的 VAS 评分^[13];(3)通过观察剩余骨水泥用量,对比

两组患者的骨水泥用量;(4)术前、术后 6 个月对患者行侧位 X 线片,检测患者的伤椎原椎体前缘高度(h1)、伤椎上位椎体前缘高度(h2)、伤椎下位椎体前缘高度(h3)及伤椎 cobb 角,对比两组椎体高度恢复率及 cobb 角恢复情况,伤椎椎体高度恢复率 = (术后 h1 - 术前 h1) / [(术前 h2 + 术前 h3) / 2] - 术前 h1,伤椎 cobb 角恢复度数 = 术前伤椎 cobb 角 - 术后伤椎 cobb 角度^[14]。

1.4 统计学分析

采用 SPSS24.0 软件进行统计学分析,计数资料以百分率表示,组间比较行卡方检验分析,计量资料用 $\bar{x} \pm s$ 表示,组间比较行 t 检验,以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组的骨水泥渗漏率及渗漏部位的对比

如表 2 所示,B 组的骨水泥渗漏率均明显低于 A 组($P<0.05$)。

2.2 两组术前、术后 6 个月 VAS 评分、治疗中骨水泥用量、椎体高度恢复率及 cobb 角恢复情况的对比

如表 23 所示,A 组的骨水泥用量明显高于 B 组($P<0.05$),两组的 VAS 评分、椎体高度恢复率、cobb 角恢复情况对比差异无统计学意义($P>0.05$)。

3 讨论

骨质疏松症临床特征是骨量减少、骨小梁微结构被破坏、骨皮质变薄,增加患者的骨折风险^[15,16]。骨质疏松椎体压缩性骨折是骨质疏松患者最常见的一种的骨折类型^[17]。PVP 手术是在

影像学辅助下经皮肤向骨折椎体注入骨水泥,以稳定椎体,缓解患者疼痛症状^[18,19]。与传统手术相比,其具有创伤小、疗效迅速等优点,常用于椎体骨折的治疗中,但目前骨水泥渗漏已成

为一种常见的并发症,发生率为3.3%~75.6%。因此,如何降低PVP手术的骨水泥渗漏是目前临床的研究重点^[20,21]。

表2 两组骨水泥渗漏率及渗漏部位比较[例(%)]

Table 2 Comparison of the bone cement leakage rate and leakage site between the two groups[n (%)]

Groups	n	Paraspinal venous leakage	Prevertebral soft tissue leakage	Puncture channel leakage	Total leakage rate
Group A	30	5	1	1	7(23.3)
Group B	31	1	0	0	1(3.2)*

Note: Compared with group A, * $P < 0.05$, the same below.

表3 两组术前、术后6个月的VAS评分、治疗中的骨水泥用量、椎体高度恢复率及cobb角恢复情况对比

Table 3 Comparison of the VAS scores, bone cement dosage, vertebral height recovery rate and cobb angle recovery before and after 6 months between the two groups

Groups	n	VAS score (score)		Bone cement dosage(mL)	Vertebral height recovery rate(%)	Cobb corner(°)
		Preoperative	Postoperative			
Group A	30	7.5± 2.1	2.4± 0.7	4.4± 1.0	12.2± 2.5	4.9± 1.3
Group B	31	7.3± 2.3	2.6± 0.8	3.8± 1.1*	11.8± 2.6	4.7± 1.4

椎静脉系是一种独立静脉系统,分为椎体静脉密集区,约有6~8支椎体静脉,且其管径较大;椎体上1/3、下1/3平面为椎体静脉疏松区,其静脉数量明显少于椎体静脉密集区;椎静脉系缺乏静脉瓣膜,且与远处的髂、腰、胸、颈、颅的静脉交通,为骨水泥的远处转移提供了条件^[22-24]。有研究显示^[25]骨水泥渗漏与椎体静脉分布有关,本研究回顾性分析了在椎体静脉不同区域注入骨水泥对PVP手术骨水泥渗漏的影响。结果显示在椎体静脉疏松区注入骨水泥,可显著降低PVP手术的骨水泥渗漏率及椎旁静脉骨水泥渗漏率,尤其是降低椎旁静脉骨水泥渗漏,主要是由于骨水泥通过椎体静脉系渗漏部位与椎体内静脉引流方向相同,而椎体静脉密集区的血管数量较多,导致其骨水泥渗漏总发生率及椎旁静脉骨水泥渗漏较高^[26-28]。此外,椎体密集区所需骨水泥量明显高于椎体静脉疏松区,可能是由于椎体疏松区位于椎弓根下1/3平面处,骨质疏松性椎体骨折时,患者多为上下缘压缩,导致压缩后骨质填充,从而不利于骨水泥在椎体中弥散,降低其注入量^[29]。本研究两组的VAS评分、椎体高度恢复率、cobb角恢复情况对比差异无统计学意义,表明椎体静脉疏松区及密集区注入骨水泥对患者的疼痛缓解、受损椎体恢复均有效,可能是由于椎体压缩性骨折患者的疼痛缓解及受损椎体恢复与骨水泥注入量并无相关性,提示并非骨水泥注入越多,患者恢复越好^[30,31]。

综上所述,与椎体静脉密集区相比,在椎体静脉稀疏区注入骨水泥可显著降低骨质疏松椎体压缩性骨折患者PVP术中骨水泥渗漏率,椎体静脉稀疏区可作为PVP术中骨水泥注射的一个相对安全区域。

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