

新型定位板在经椎间孔腰骶神经根封闭术 术前定位中的应用

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【摘要】目的:探讨新型定位板应用在腰椎后外侧经椎间孔腰骶神经根封闭术的术前定位中的有效性、可靠性。**方法:**2015 年 3 月~2016 年 3 月收治腰椎退行性疾病患者 102 例,其中单节段腰椎间盘突出症 51 例,单节段腰椎管狭窄症 42 例,经皮内窥镜下腰椎间盘切除术症状复发 9 例,采用随机数字表随机分入两组后行腰椎后外侧经椎间孔腰骶神经根封闭术。A 组 54 例,手术节段为 L3/4 8 例、L4/5 28 例、L5/S1 18 例,采用新型定位板术前定位;B 组 48 例,手术节段为 L3/4 8 例、L4/5 26 例、L5/S1 14 例,采用金属定位针术前定位。两组患者年龄、性别、手术节段、保守治疗时间均无统计学差异($P>0.05$)。记录两组术前的透视次数和准备时间、穿刺时间、穿刺期透视次数、手术并发症、穿刺术后 1h 穿刺区疼痛 VAS 评分,并进行统计学分析。**结果:**A 组术前的准备时间为 $5.2\pm 1.0\text{min}$ 、透视次数为 1.1 ± 0.3 次,穿刺时间 $9.6\pm 2.2\text{min}$,穿刺期透视次数 3.1 ± 1.0 次;B 组术前的准备时间为 $10.7\pm 2.3\text{min}$ 、透视次数为 3.8 ± 1.2 次,穿刺时间 $16.3\pm 3.3\text{min}$,穿刺期透视次数 4.6 ± 0.6 次,两组比较均有统计学差异($P<0.05$),A 组均优于 B 组。两组均未出现椎管内血肿、腹腔脏器损伤、下肢感觉和运动功能异常,B 组出现硬膜裂裂 1 例(1/48)、穿刺区域皮下血肿 4 例(4/48),两组并发症发生率无统计学差异($P>0.05$);术后 1h 穿刺区域疼痛 VAS 评分,A 组为 3.4 ± 0.5 分,B 组为 5.0 ± 0.9 分,有统计学差异($P<0.05$)。**结论:**对于经椎间孔腰骶神经根封闭术,使用新型定位板术前定位,并进行穿刺路径设计,可减少术前透视次数、术前准备时间,有助于缩短穿刺时间及穿刺期透视次数,定位板具有使用方便、可靠、有效等优点。

【关键词】腰椎退行性疾病;定位板;腰骶神经根封闭术

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【Abstract】 Objectives: To discuss the effectiveness and reliability of using a new type of orientating plate for lumbar posterolateral transforaminal lumbosacral nerve root blocks. **Methods:** 102 patients with lumbar degenerative diseases were enrolled in the study between March 2015 and March 2016, including single-segment lumbar disc herniation in 51 cases, single-segment lumbar spinal stenosis in 42 cases, recurrence after percutaneous endoscopic lumbar discectomy in 9 cases. All patients received lumbar posterolateral transforaminal lumbosacral nerve root blocks after being divided into two groups with the random number table. Group A: 54 patients were performed with new type of orientating plate before operation, including 8 cases in L3/4 level, 28 cases in L4/5 level, 18 cases in L5/S1 level. Group B: 48 patients were performed with metal locating needle, including 8 cases in L3/4 level, 26 cases in L4/5 level, 14 cases in L5/S1 level. There were no significant differences in age, sex, operative level, conservative treatment time between the two groups($P>0.05$). The preoperative fluoroscopy times, the preparation time, the puncture time, the fluoroscopy times during puncturing, the complication of operation, the VAS pain score of the punctured area 1h after operation were measured and analyzed. **Results:** In group A, the preparation time was $5.2\pm 1.0\text{min}$, the preoperative fluoroscopy times were 1.1 ± 0.3 , the puncture time was $9.6\pm 2.2\text{min}$ and the fluoroscopy times during puncturing

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were 3.1 ± 1.0 , while in group B, the preparation time was 10.7 ± 2.3 min, the preoperative fluoroscopy times were 3.8 ± 1.2 , the puncture time was 16.3 ± 3.3 min, the fluoroscopy times during puncturing were 4.6 ± 0.6 , there were significant differences between group A and group B ($P < 0.05$). There were no intraspinal hematoma, abdominal organ injury, impairment of sensory and motor functions in lower limbs between two groups. The dural puncture occurred in 1 case of group B (1/48). The subcutaneous hematoma of punctured area occurred in 4 cases of group B (4/48). There was no significant difference in the rate of complications between two groups ($P > 0.05$). The VAS pain score of the punctured area 1h after operation was 3.4 ± 0.5 in group A and 5.0 ± 0.9 in group B, there was significant difference between group A and group B ($P < 0.05$). **Conclusions:** For transforaminal lumbosacral nerve root blocks, preoperative location and the design of puncture track by using new type of orientating plate can reduce the preoperative fluoroscopy times, the preoperative preparation time, and help to shorten the puncture time and the fluoroscopy times during puncturing, therefore, new type of orientating plate is easy to use, reliable and effective.

[Key words] Lumbar degenerative diseases; Orientating plate; Lumbosacral nerve root blocks

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腰椎后外侧经椎间孔穿刺术是诊断性神经根封闭术、治疗性神经根封闭术、经皮内窥镜下腰椎间盘突出切除术的必要手术操作步骤,应用广泛。现存的各种术前定位、导航技术均有不足之处,如 CT 定位精确但不可避免大量射线暴露^[1],术中磁共振导航、超声导航虽可避免 X 射线暴露^[2],但磁共振导航仅在少数医院装备,而超声导航技术可靠性还有待继续研究。O 型臂 X 线机透视具有定位准确、射线暴露少的优势,但 O 型臂 X 线透视机在基层医疗机构普及率低。目前,临床上通常使用金属针作为腰椎后外侧经椎间孔穿刺术术前的定位工具,金属针定位不精确,需反复多次操作,术前准备时间长,X 射线暴露多,为此我们设计了新型定位板以求简化定位操作。本研究将新型定位板应用到腰椎后外侧经椎间孔腰骶神经根封闭术的术前定位中,探讨其有效性、可靠性。

1 资料与方法

1.1 一般资料

纳入条件:(1)腰椎间盘突出症,主要表现为腰痛伴或不伴下肢的放射性疼痛,术前 MRI、CT 支持诊断;(2)腰椎管狭窄症,间歇性跛行,伴或不伴下肢的放射性疼痛,术前 MRI、CT 支持诊断;(3)2 年内因腰椎间盘突出症接受经皮内窥镜下腰椎间盘突出切除术,症状复发;(4)术前已接受至少 3 个月规范的保守治疗,症状无明显改善并影响生活。排除标准:(1)伴有全身或腰椎感染、骨折、肿瘤等疾病的患者;(2)凝血功能异常;(3)麻醉药物过敏,不能耐受麻醉;(4)患者因疼痛严重,保持

强迫体位,不能耐受局麻手术;(5)其他影响手术的禁忌证。

2015 年 3 月~2016 年 3 月符合上述纳入、排除标准并行腰椎后外侧经椎间孔腰骶神经根封闭术的腰椎退行性疾病患者 102 例,其中男 49 例,女 53 例,年龄 40~70 岁(60.4 ± 5.1 岁)。单节段腰椎间盘突出症 51 例,单节段腰椎管狭窄症 42 例,经皮内窥镜下腰椎间盘突出术后症状复发 9 例。采用随机数字表将其分入两组,其中 54 例采用新型定位板术前定位(A 组),48 例采用金属定位针术前定位(B 组),两组患者年龄、性别、手术节段、保守治疗时间均无统计学差异($P > 0.05$,表 1)。

1.2 新型定位板

新型定位板为乳胶材质,其中均匀地加入钡剂,可耐受常规高温消毒,质地柔软、坚韧,能够贴合患者背部曲线放置,具有 X 射线不可通过性;长 17cm、宽 11cm,可满足腰椎区域定位,其以长

表 1 两组患者术前一般情况

Table 1 Preoperative general status

	A 组 (n=54) Group A	B 组 (n=48) Group B
年龄 (岁) Age(year)	59.9 ± 6.1	60.9 ± 4.6
性别 Gender(n, %)		
男 Male	26(48%)	23(48%)
女 Female	28(52%)	25(52%)
手术节段 Operative level		
L3/4	8(15%)	8(17%)
L4/5	28(52%)	26(54%)
L5/S1	18(33%)	14(29%)
保守治疗时间(月) Conservative treatment time (month)	5.7 ± 1.3	5.9 ± 1.6

宽均为 1cm 的网格为基本单位,使用斜线、三角、圆圈、方形等微小结构将网格进行分区,便于快速定位。新型定位板网格设计较为致密,无论靶点落在网格内或者网格连接处,均可准确定位。将两块定位板粘接使用或者采用大型号的定位板,将其平置在患者腰背部,即可进行正侧位透视定位。

1.3 手术方法

A、B 两组均由同一组操作熟练的医师完成。均采取 Kambin 三角入路,行后外侧经椎间孔腰骶神经根封闭术^[3-6]。

1.3.1 新型定位板术前定位(A 组) 患者取俯卧位,将定位板展平置于患者腰部正中,移动 C 型臂,透视,嘱咐患者制动,在监视器上确定责任间隙,设计穿刺路线,并确定其在定位板上经过的

2 个标记点,在患者背部以记号笔标记标记点,移除定位板,将 2 个标记点连线即为穿刺路径,确定穿刺点,消毒铺单,依照穿刺路径穿刺,调整穿刺针方向,正侧位透视确认穿刺针尖到达椎间孔靶点,注射药物。诊断性封闭 29 例(图 1),注射局麻药物(1%利多卡因 2ml);治疗性封闭 25 例,注射局麻药物(1%利多卡因 2ml)和类固醇激素(复方倍他米松 1ml),穿刺完毕,拔出穿刺针。

1.3.2 金属定位针术前定位(B 组) 患者取俯卧位,在正侧位 X 线片上观察双侧髂嵴与责任椎间隙高度关系,触诊患者髂嵴,将金属定位针横行放置在患者背部,移动 C 型臂,透视,在监视器上观察金属定位针投影与责任椎间隙的关系,调整金属定位针再次透视,重复以上步骤直至金属定位

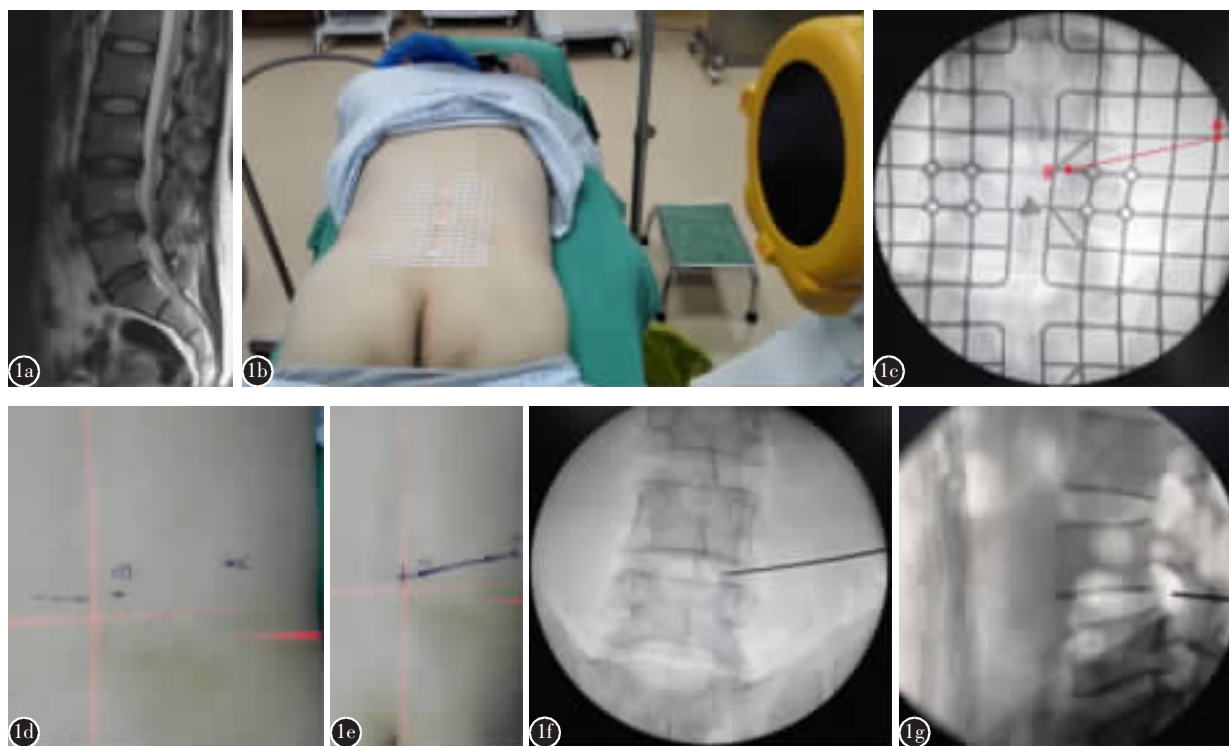


图 1 患者男,49 岁,右下肢间断疼痛 4 个月入院,疼痛部位为右下肢后侧、右足底,使用新型定位板定位,经 L4/5 右侧椎间孔行诊断性神经根封闭术 a MRI 示 L3/4、L4/5、L5/S1 退变,L4/5 椎间盘突出 b 将定位板置于患者背部,透视定位 c 在显示器上设计穿刺路径,并确定标志点 A、B 点 d 在患者背部标记 A、B 两点后移除定位板 e 经 A、B 两点连线确定穿刺路径,并确定穿刺点 f、g 沿穿刺路径完成穿刺,穿刺针尖到达靶点,注射 1%利多卡因 2ml,右下肢疼痛大部分缓解

Figure 1 A 49-year-old man with 4-month history of intermittent right lower limb pain, the pain site was back of right lower limb and right planta, the L4/5 right transforaminal diagnostic nerve root blocks was performed with new type of orientating plate a Sagittal MRI showed lumbar disc degeneration in L3/4, L4/5, L5/S1 and disc herniation in L4/5 b The plate was placed in the back of the patient, locating by fluoroscopy c The puncture track was designed on the display, meanwhile, the marking point A and B was determined d After marking the point A and B in the back of the patient, remove the orientating plate e Mark the puncture track by connecting the point A and B in the back of the patient, determine the puncture point f, g Along the puncture track puncture till the needle tip reach the target, inject 2ml 1% lidocaine, right lower limb pain were mostly relieved

针投影在责任椎间隙合适位置,沿金属定位针划线确定穿刺路径及穿刺点,消毒铺单,依照穿刺路径穿刺,穿刺及注射药物步骤同前,诊断性封闭 26 例(图 2),治疗性封闭 22 例。

1.4 观察指标

记录术前准备时间(从第 1 次透视至标记好穿刺路径的时间),术前透视次数(从第 1 次透视至标记好穿刺路径期间的透视次数),穿刺时间(穿刺针刺入皮肤至针尖到达椎间孔靶区的时间),穿刺期的透视次数^[7],穿刺术并发症^[8,9],术后 1h 穿刺区域疼痛 VAS 评分,所有数据均由参与手术的另一主管护师记录统计。

1.5 统计分析

采用 SPSS 19.0 进行统计学分析。计量资料采用均数±标准差表示,组间比较采用 *t* 检验、秩和检验;计数资料采用例数(百分比)表示,组间比较采用卡方检验。 $P<0.05$ 为差异有统计学意义。

2 结果

两组患者均完成经椎间孔穿刺术,A、B 两组的术前准备时间和透视次数、穿刺时间、穿刺期透视次数均有统计学差异($P<0.05$),A 组均优于 B 组(表 2)。穿刺术中,两组均未出现椎管内血肿、腹腔脏器损伤、下肢感觉、运动异常。B 组出现硬膜刺裂 1 例(1/48,为 L5/S1),停止操作,3d 后再行经椎间孔神经根封闭术;穿刺区域皮下血肿 4 例(4/48,1 例为 L4/5,3 例为 L5/S1),两组并发症发生率无统计学差异($P>0.05$)。术后 1h 穿刺区域疼痛 VAS 评分,A 组为 3.4 ± 0.5 分,B 组为 5.0 ± 0.93 分,差异有统计学意义($P<0.05$)。

3 讨论

3.1 传统术前透视定位存在的问题

Yeom 等^[4]报道在穿刺针尖到达靶点后,使用二维透视进行确认,并未详细提及术前定位方法。

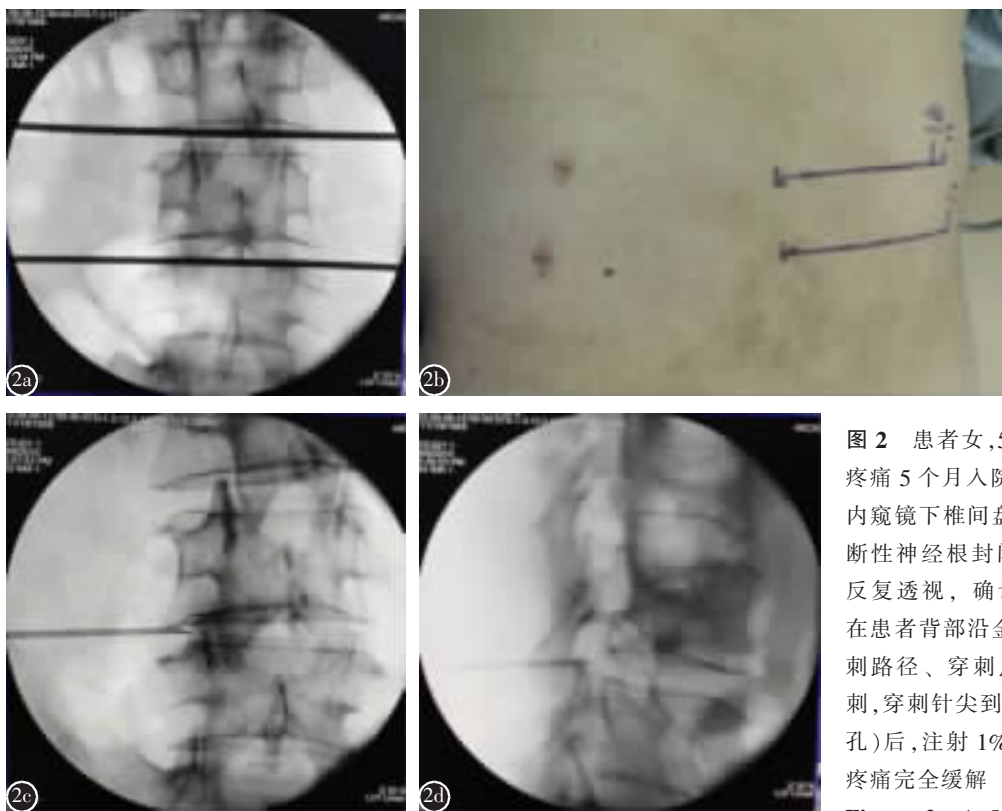


图 2 患者女,52 岁,因腰痛及右下肢疼痛 5 个月入院,1 年前曾 2 次行经皮内窥镜下椎间盘切除术,入院后行诊断性神经根封闭术 a 用金属定位针反复透视,确认 L3/4、L4/5 椎间隙 b 在患者背部沿金属定位针划线确定穿刺路径、穿刺点 c、d 沿穿刺路径穿刺,穿刺针尖到达靶点(L4/5 右侧椎间孔)后,注射 1%利多卡因 2ml,右下肢疼痛完全缓解

Figure 2 A 52-year-old woman with

5-month history of low back pain and right lower limb pain, receiving two percutaneous endoscopic lumbar discectomy (PELD) 1 year ago. After admission she received diagnostic nerve root blocks a Lumbar intervertebral spaces of L3/4 and L4/5 were confirmed by repeated fluoroscopy with two metal locating needle b Mark the puncture track along the metal locating needle and determine the puncture point in the back of the patient c, d Along the puncture track puncture till the needle tip reach the target(right intervertebral foramen of L4/5), inject 2ml 1% lidocaine, right lower limb pain were completely relieved

表 2 两组围手术期指标比较 ($\bar{x} \pm s$)

Table 2 Comparison of the perioperative data between two groups

	A组 (n=54) Group A	B组 (n=48) Group B
术前准备时间(min) The preparation time	5.2±1.0	10.7±2.3 ^①
术前透视次数 The preoperative fluoroscopy times	1.1±0.3	3.8±1.2 ^①
穿刺时间(min) The puncture time	9.6±2.2	16.3±3.3 ^①
穿刺期透视次数 The fluoroscopy times during puncturing	3.1±1.0	4.6±0.6 ^①

注:①与 A 组比较 $P<0.05$ Note: ①Compared with group A, $P<0.05$

Makkar等^[6]报道依靠术前透视调整正侧位上手术节段终板及上关节突的形状,进而确定穿刺点,操作复杂,透视次数多。Wewalka等^[1]报道了CT导航下联合多种药物进行经椎间孔神经根封闭治疗腰部持续疼痛,术前定位、术中操作均不可避免大量射线暴露。临床上使用金属定位针作为辅助定位工具,术者首先要根据体表标志,在患者背部摆放金属定位针,再通过反复透视,调整金属定位针的位置,确定穿刺路径。存在如下问题:(1)依靠髂嵴等体表标志,摆放金属定位针后需要反复多次透视并调整定位针位置,增加了术者、患者的透视暴露,特别是肥胖患者体表标志触摸不清,很难依据经验将金属定位针摆放在合适的位置上,透视调整次数多;(2)反复透视调整金属定位针,增加了术前的准备时间,部分腰椎间盘突出症患者下肢疼痛难耐,保持强迫体位,术前不能耐受长时间俯卧体位,使用金属定位针定位,术前准备时间长,使手术无法进行,另外,缩短术前准备时间也相应缩短了整个手术时间;(3)为了减少术前透视X线暴露,减少术前透视调整次数常使穿刺路径不够精确,在穿刺术中增加了穿刺针调整的机率,增加了术中透视的次数,延长了手术时间,而且反复调整穿刺针也会增加患者的痛苦。

3.2 新型定位板定位的有效性

本研究中,A组54例患者使用新型定位板设计穿刺路径并完成穿刺操作,相较于B组使用金属定位针进行定位,明显减少了术前的透视次数,缩短了术前准备时间。经L5/S1椎间孔穿刺需要同时避开髂嵴和横突,对于腰椎部分骶化的患者,横突肥大以至于穿刺靶点狭小,借助新型定位板

犹如在患者腰骶部解剖结构中使用“GPS”,术前透视1次即可在患者背部标记好穿刺路径,相较金属定位针,定位板定位更加简便。另外,Fan等^[7]报道了一种定位系统应用于经皮内窥镜下腰椎间盘突出切除术,定位方法及穿刺路径设计与本研究相似,术中使用半环状定位设备达到三维定位。考虑到神经根封闭术穿刺靶点仅在椎间孔出口处,不需要将穿刺针深入到椎间盘,操作相对简单,而且术中架设半环状定位设备亦需要花费时间,定位架的微动都要增加穿刺针调整的次数。因此,新型定位板虽为平面定位,但足以满足神经根封闭术的实际需要。

3.3 新型定位板定位的安全性

与腰椎后外侧经椎间孔穿刺相关的并发症包括肾脏或腹膜损伤、硬膜刺破、血管损伤、神经损伤、椎管内血肿、椎间盘损伤、穿刺点皮下血肿等,并发症的发生与解剖变异、椎体结构退变、透视技术及术者的手术技巧等因素相关^[3,5,10-14]。术后椎管内血肿可表现为腰痛、下肢感觉与肌力异常、尿潴留等症状,常出现在术后48h内,腰椎MRI可资鉴别,对于术中有明显出血的患者应留院观察1d^[9]。硬膜刺破并将局麻药及类固醇激素注入硬膜下或蛛网膜下可导致神经损伤、暂时性下肢麻痹、头痛等症状,硬膜刺破可通过注射药物前回吸脑脊液或造影剂的异常影像予以发现^[9]。本研究B组出现1例脑脊液回吸,遂停止操作,待3d后再进行经椎间孔神经根封闭术。本研究未常规使用造影剂,可能增加了硬膜刺破的漏诊率。脏器损伤主要通过术中疼痛、术后腹痛、血尿等异常表现予以排查,必要时可行B超、CT等影像学检查辅助诊断,本研究中均未发生腹腔脏器损伤。

A组使用新型定位板,术前理论上仅需前后位透视1次即可精准设计穿刺路径,穿刺过程中穿刺针沿着穿刺路径适度调整针尾挺立角度就可达到穿刺靶点,穿刺操作流畅。而B组为了尽量减少术前透视次数,设计的穿刺路径不够精确,穿刺路径仅作为参考,在术中不仅需要调整针尾的挺立角度,必要时还需要调整针尾的水平方向。A组相较B组不需要反复调整穿刺针的方向,减少了术中透视次数,缩短了穿刺时间,避免了盲目穿刺对神经、血管等重要组织的干扰,术后评估穿刺区域不适情况,B组有4例患者(1例为L4/5,3例为L5/S1)因反复调整穿刺针,导致穿刺区域皮下

血肿, 术后 1h 穿刺区域疼痛 VAS 评分两组间存在统计学差异, 也体现出了新型定位板准确定位的优势。

综上所述, 将新型定位板应用在腰椎后外侧经椎间孔腰骶神经根封闭术前定位中, 并进行穿刺路径设计, 减少了术前透视次数、术前准备时间, 因穿刺路径精确, 也能缩短术中透视次数, 减少穿刺针的调整, 避免组织损伤, 解决了传统金属定位针定位不准确、术前准备时间长的问题。新型定位板造价低廉、定位准确、可反复使用等优点有利于其推广使用, 而配合定位板的术中导航技术还需要继续研究。

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