

• 综述 •

影像引导下腹腔神经丛毁损术的研究进展

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[摘要] 腹腔神经丛毁损术(NCPB)常用于治疗上腹部癌症患者的疼痛,其原理是对腹腔神经丛注射神经破坏药以破坏神经,进而达到缓解疼痛的目的。由于腹腔神经丛解剖位置的特殊性,如何精准地注射神经破坏药以提高毁损的成功率及降低并发症的发生率是该领域的研究热点。随着影像技术的不断发展,NCPB 的治疗方式及疗效不断提高。本文旨在探讨影像引导下 NCPB 治疗上腹部顽固性癌痛的研究进展。

[关键词] 腹腔神经丛毁损术;疼痛;影像引导

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Image-Guided Neurolytic Celiac Plexus Block: A Review

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[Abstract] Neurolytic celiac plexus block (NCPB) has been performed extensively for severe upper abdominal pain of cancer patients. It alleviates refractory upper abdominal pain by injecting medications causing nerve damage in solar plexus. Due to the special location of the plexus, how to precisely inject nerve damage drugs are essential for improving the success rate of neurolysis and minimizing complications. With the development of imaging technology, the management of NCPB has improved over time. The purpose of this study, therefore, is to review the progress of image-guided NCPB in intractable cancer pain treatment.

[Key words] Neurolytic celiac plexus block; Pain; Image guidance

顽固性腹痛严重影响上腹部中晚期癌症及慢性疼痛患者的生活质量,按照 WHO 的镇痛阶梯原则,药物镇痛治疗是最常见的疼痛缓解方法,但药物止痛效果差、成瘾性及不良反应等可能降低患者生活质量。腹腔神经丛毁损术(neurolytic celiac plexus block, NCPB)通过对腹腔神经丛注射神经破坏药以破坏神经,阻断疼痛传导,可有效缓解疼痛并减少镇痛药物的使用^[1-4]。自 1914 年首次应用于临床以来,NCPB 已在全世界广泛开展^[5]。近年来,世界卫生组织癌症缓解计划已推荐 NCPB 为缓解上腹部癌症患者疼痛的方式^[1-5]。

NCPB 可通过化学方法或物理方法毁损腹腔神经丛,从而缓解疼痛^[2-5]。该方法适用于合理药物治疗疼痛效果欠佳或无效的上腹部中晚期癌症或慢性疼痛的患者^[6-7]。早期 NCPB 以体表解剖为标记,采取盲探的穿刺方法,神经毁损效果较差。近年来,随着影像学技术的迅速发展,X 线透视、CT、MRI、超声、内镜超声、胸腔镜引导下 NCPB 治疗上腹部顽固性癌性疼痛的应用日益广泛^[6-7]。有鉴于此,本文对影像引导下腹腔神经丛毁损术及研究进展进行综述。

1 腹腔神经丛的正常解剖及疼痛阻滞机制

腹腔神经丛是人体最大的内脏神经丛,包含腹腔神经节、肠系膜上节等交感神经节。来源于内脏

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大、小神经的交感神经节前纤维经交感神经节内换元后,其节后纤维与来自迷走神经的副交感纤维共同组成腹腔神经丛。95% 腹腔神经丛位于 T12 ~ L1 椎体之间、腹腔干动脉根部的前方或两侧、肾上腺前方或内侧、膈脚外侧,呈网状分布。腹腔神经丛支配肝脏、胆囊、胆道、胰腺、脾脏、肾上腺、肾脏、肠系膜、小肠、大肠近端包括横结肠。因此,阻断腹腔神经丛能缓解上腹部肿瘤引起的疼痛。

2 不同影像学方法引导下 NCPB

2.1 X 线透视引导下 NCPB

首例 X 线透视引导下 NCPB 报道于 1979 年^[8]。目前,X 线透视引导下 NCPB 多采用椎旁后入路;与传统盲穿相比,X 线透视能够清楚地显示椎体与穿刺针的位置关系,便于术中调整穿刺角度,提高神经毁损的准确性。其缺点为分辨率低,不能清晰显示腹腔丛、胰腺、血管、肿瘤、淋巴结及神经破坏药的扩散情况。倪家骧^[9]报道,经椎旁入路有损伤椎旁腰动脉导致截瘫的风险等。此外,患者和术者均会受到大剂量的电离辐射^[7]。

2.2 CT 引导下 NCPB

随着多层螺旋 CT、三维后处理技术及四维 CT 成像技术的发展,CT 已能够清晰显示腹腔神经丛及其周围血管、脏器结构及穿刺针尖位置^[10]。神经破坏药和对比剂的同时使用使药物分布集中,减少了神经破坏药用量过大造成的大血管侵蚀等严重并发症^[11]。在 CT 平扫、增强门脉期,腹腔神经丛的密度与同侧肾上腺相近;而在延迟期,约 66.7% 的个体中腹腔神经丛密度高于同侧肾上腺^[10-12]。Patela 等^[13]报道,多层螺旋 CT 三维容积扫描是评估胰腺癌神经受累情况的理想检查方式,90% 的胰腺癌累及神经丛表现为胰头后内侧的粗网状、条索状结构或不规则肿块,这就有利于临床医生判断 NCPB 是否适用于患者。

CT 引导下 NCPB 的穿刺路径包括经皮前入路、经椎间盘入路、经主动脉入路、经膈脚入路等。经皮前入路操作时间短,适用于不能忍受俯卧位或侧卧位的患者,但有损伤内脏器官的风险,并有可能导致继发损伤,如感染、出血、瘘管形成、肝出血及胃穿孔等。后入路经椎间盘可避免椎旁腰动脉及邻近脏器损伤引起的并发症,疗效优于经椎旁后入路。但对于严重胸腰椎退行性变者,此入路较困难^[14]。后入路经腹主动脉 NCPB 优势在于可减少神经破坏药扩散到腰丛或脊髓,从而引起致神经并发症,但其主

要缺点在于医源性主动脉穿刺增加了腹膜后出血的风险,可发生在高达 0.5% 患者中,尤其是高血压或凝血障碍患者^[14]。经膈脚入路是将神经破坏药注射在横膈脚、腹主动脉和椎体之间的膈脚后间隙中,此入路简便、有效、无穿刺并发症^[15-16],但操作较为复杂,不能实时引导,周围解剖结构及针尖位置的显示受金属穿刺针散射伪影的影响,并有电离辐射。

2.3 MR 引导下 NCPB

MR 可做到多参数、多层面、多方位成像,具有较高的时间、空间分辨率和软组织对比度,并且其特有的血管流空效应能清晰地显示血管,同时光学导引系统可定位追踪并动态显示 MR 穿刺针平面图像,有利于三维空间内评估进针角度。此外,MR 技术并无电离辐射。在脂肪抑制 T1WI、T2WI 序列上,大部分腹腔神经丛分别表现为稍低信号、稍高信号的板状或线状结构。在 MR 增强图像中,呈渐进性强化^[17-18]。近年来,MR 三维神经成像技术、扩散张量纤维束示踪成像技术等逐渐应用于临床;这些技术可清晰显示腹腔神经丛的微细结构、分布及走行等,使穿刺更准确、安全、可靠^[18-19]。然而,磁共振成像易受患者呼吸、动脉血管搏动等运动伪影及腹部空腔脏器吻合术后吻合器等伪影影响,且需要特殊开放性核磁及光学引导系统的设备支持,价格昂贵^[17-19]。

2.4 超声引导下 NCPB

超声引导下 NCPB 简便快捷,无放射损伤,并且彩色多普勒超声可清晰辨别腹主动脉及邻近血管,并实时动态观察腹腔脏器结构及引导穿刺针避让血管。在超声声像图中,腹腔神经丛呈分叶或长圆形的高回声结构。近年来,超声引导下 NCPB 治疗顽固性疼痛取得了良好的效果,无严重并发症^[14,20-21]。由于受消化道气体的影响,超声显示腹膜后脏器血管的效果不如 CT 和 MRI。随着超声造影及实时虚拟导航技术的发展,这一不足或可被弥补。超声造影可实时动态观察药物的注射过程及其弥散的范围,但目前国内外尚无相关报道。实时虚拟导航系统实现了 CT/MRI 与超声在三维空间内多点匹配、融合成像,超声可全面、精细、实时地扫描 CT/MRI 扫描区域的脏器血管,从而精确定位,减少并发症的发生^[22]。

2.5 内镜超声引导下 NCPB

内镜超声(endoscopic ultrasonography, EUS)引导下 NCPB 已开展 20 余年^[23]。相较于 X 线、CT、MRI,内镜下经胃后壁精准定位与胃腔一壁之隔的

腹腔神经节,穿刺距离最短,降低药物扩散至躯体神经根、硬膜外、蛛网膜下腔引起神经损伤的风险,并发症发生率普遍低于经皮穿刺入路,具有安全性高、创伤小、实时动态等优势^[24],有研究报道 EUS 较 CT 引导下 NCPB 更有效且成本更低^[25]。除了不能耐受胃镜检查、有严重出血倾向及感染的患者外, EUS-NCPB 无绝对禁忌证^[25-28]。Puli 等^[26]通过 meta 分析发现, EUS 引导下 NCPB 疼痛缓解率为

表 1 不同 NCPB 影像引导技术比较
Table 1. Imaging Modalities Used to Guide Celiac Plexus Block (NCPB)

Modality	Advantages	Disadvantages
Non-imaging-guided NCPB	No need for imaging-compatible equipment	High risk High incidence of complications
X ray fluoroscopy-guided NCPB	More accurate Higher success rate Lower incidence of complications Clearly show the spacial relationship between vertebral body and puncture needle	Low resolution a risk of paraplegia Exposure to ionizing radiation Can not clearly show the spread of abdominal plexuses, pancreas, blood vessels, tumors, lymph nodes and nerve damage drugs
CT-guided NCPB	More accurate in that it can clearly display the celiac nerve plexus and its surrounding blood vessels, organ structure and the position of puncture needle tip	CT equipment required ionizing radiation Display of the surrounding anatomical structure and the position of the needle tip are affected by the scattering artifacts of the metal puncture needle
MRI-guided NCPB	Time, spatial resolution and soft tissue contrast are higher than CT Microstructure, distribution and course of celiac plexuses are displayed clearly, making puncture more accurate, safer and free of ionizing radiation	Expensive Easy to be affected by artifact such as motion artifact and stapler after anastomosis MRI imaging-compatible equipment needed
Ultrasound-guided NCPB	Can distinguish the abdominal aorta and its adjacent vessels, observe the structure of abdominal organs dynamically, guide the puncture needle to avoid the blood vessels in real time	Ultrasound imaging-compatible equipment needed
Endoscopic ultrasound-guided NCPB	High safety small trauma real-time dynamic Shortest puncture distance Incidence of complications is generally lower than that of percutaneous puncture approach	Endoscopic ultrasound imaging-compatible equipment required Not applicable to patients who cannot tolerate gastroscopy

3 疗效及影响因素

现有研究表明, NCPB 的疼痛缓解效果与肿瘤的位置、穿刺针尖位置、药物弥散范围、与神经丛作用时间等相关^[28-33]。Catalano 等^[30]认为胰体尾部 NCPB 疗效优于胰头部。蔡昌平等^[31]报道不同形状的腹腔神经节,其毁损位置及毁损量亦不同。Iwata 等^[32]报道酒精粘度低易向疏松的肾周脂肪囊或腹腔渗出,无法包绕腹主动脉, NCPB 效果差。Obstein 等^[33]对猪注射泊洛沙姆行 NCPB, 研究表明泊洛沙姆凝胶状包绕相应节段腹主动脉, 疗效安全且持久。Leblanc 等^[34]报道单针法 EUS-NCPB 与双针法 NCPB 在注射相同剂量的神经破坏药后, 二者在疼痛缓解持续时间及疼痛开始缓解时间上无差异。付霜等^[35]报道相比单次给药, 连续膈脚后神经毁损术

80.1%, 较传统疼痛治疗疼痛缓解显著。Arcidiacomo 等^[27]评价了 EUS-NCPB 与阿片类药物治疗胰腺癌痛的疗效, 证实 EUS-NCPB 组患者癌性疼痛在 4~8 周内得到缓解, 药物用量降低。

综上所述, 不同技术用于引导 NCPB 时都有其各自的优缺点(表 1)。临床医生在考虑 NCPB 时, 应结合这些技术的优缺点与患者的实际情况进行选择。

疼痛缓解效果好。总体而言, NCPB 能显著降低患者的总体疼痛和吗啡消耗量。

4 并发症

NCPB 最常见的并发症为局部背痛, 发生率高达 96%, 可能与膈肌刺激辐射到肩部有关, 通常在 72 小时内缓解^[25]。术后腹泻和短暂性低血压是较为常见的并发症, 发生率分别约为 44%~60%、10%~52%, 可能与副交感神经活性未受拮抗而导致肠蠕动亢进、分泌亢进和腹泻有关, 一般持续时间不超过 48 小时。最严重的神经并发症包括截瘫、震颤无力、感觉障碍等, 其中约 0.15% 的患者出现截瘫, 可能与脊髓损伤或脊髓前动脉损伤等有关^[36-37]。其他并发症包括局部血肿、气胸、乳糜胸、化学性心包炎、胃瘫、肠系膜上静脉血栓形成、血尿、阳痿、主动

脉假性动脉瘤、主动脉夹层和腹膜后纤维化等^[14,25]。

5 总 结

NCPB 被认为是一种安全、有效的方法,但尚缺乏共识或指南规范以指导癌痛患者的治疗。我们相信,随着影像技术的发展、学科理论和技术的融合,穿刺途径和毁损手段等方面的更新,疾病早期行 NCPB 治疗可有效减少镇痛药物的使用,达到最佳的疼痛缓解疗效,有助于改善患者的生活质量。

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