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彩色多普勒血流显像联合X射线在下腔静脉滤器置入治疗骨折后下肢深静脉血栓中的临床应用

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[摘　要]　**目的：**探讨彩色多普勒血流显像(color Doppler flow imaging，CDFI)联合X射线在骨折后下肢深静脉血栓(deep venous thrombosis，DVT)行下腔静脉滤器(interior vena cava filter，IVCF)置入治疗中的应用价值。**方法：**2014年1月至2017年11月对86例骨折后下肢DVT患者进行IVCF置入术，随机分为两组，X射线引导组36例，彩超联合X射线引导组50例，对比评估两组间的置入效果。**结果：**超声联合X射线组IVCF置入时间、X射线照射时间、置入成功率、并发症发生率分别为(39.2±6.3) min，(7.8±2.0) min，94.0%，6%，X射线引导组分别为(40.9±5.6) min，(11.5±2.6) min，94.4%，5.6%。超声与X射线联合组X射线照射时间短于X射线引导组(P<0.05)。置入时间、置入成功率、并发症发生率组间比较差异无统计学意义(P>0.05)。**结论：**超声联合X射线引导IVCF置入术成功率高，安全可靠，可弥补X射线引导的不足，具有较高的临床应用价值。

[关键词]　深静脉血栓；下腔静脉滤器；超声；X射线；肺动脉栓塞

Clinical application of inferior vena cava filter placement under the combination guidance of color Doppler flow imaging and X-ray in deep venous thrombosis of lower limb with fracture

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Abstract　**Objective:** To evaluate clinical value of inferior vena cava filter (IVCF) placement under the combination guidance of color Doppler flow imaging (CDFI) and X-ray in deep venous thrombosis (DVT) of lower limb with fracture. **Methods:** From January 2014 to November 2017, IVCF placement was performed on 86 DVT cases caused by lower limb fracture. The DVT cases were randomly allocated into 2 groups: 36 cases in the X-ray group

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and 50 cases in the combination group of CDFI and X-ray. The curative effect of the placement in the 2 groups was compared and evaluated. **Results:** The placement time of IVCF, X-ray irradiation time, the success rate of IVCF, the incidence of complications in the combination group were (39.2±6.3) min, (7.8±2.0) min, 94.0%, 6%, respectively; in the X-ray group were (40.9±5.6) min, (11.5±2.6) min, 94.4%, 5.6%, respectively. X-ray irradiation time in the combination group was less than that in the X-ray group (P<0.05). There was no statistical significance in the placement time of IVCF, the success rate of IVCF and the incidence of complications between the 2 groups (P>0.05). **Conclusion:** IVCF placement under the combination guidance of CDFI and X-ray is feasible and safe. Combination of CDFI and X-ray may make up the inadequacy of each other, and has great value in the clinical application.

Keywords deep venous thrombosis; inferior vena cava filter; ultrasound; X-ray; pulmonary embolism

下肢骨折患者常发生深静脉血栓(deep venous thrombosis，DVT)，在外界诱因下可能会导致血栓脱落，发生肺动脉栓塞(pulmonary embolism，PE)，从而猝死[1-3]。下肢DVT常规治疗措施主要为下腔静脉滤器(interior vena cava filter，IVCF)置入。X射线引导是IVCF置入常见的方法，临床应用广泛，但其具有辐射性，且禁忌证较多。如何避免X射线损害并达到最佳治疗效果是当前的难点。彩色多普勒血流显像(color Doppler flow imaging，CDFI)是临床常用的影像技术之一，具有无创、简便易行、无放射线等优势。本研究拟应用CDFI联合X射线术中引导下肢骨折后DVT患者行IVCF置入术，探讨CDFI联合X射线的临床应用价值。

1 对象与方法

1.1 对象

2014年1月至2017年11月中南大学湘雅三医院骨科因下肢骨折后DVT需行IVCF置入术患者86例，依据入院单双号随机分为两组，X射线引导置入组36例，年龄38~72(53.4±8.8)岁，男20例，女16例，左下肢14例，右下肢22例。超声联合X射线引导置入组50例，年龄39~75(54.6±8.2)岁，男28例，女22例，左下肢18例，右下肢32例。所有患者有下肢骨折外伤史，患肢有疼痛、肿胀等明显临床表现，经X射线、血管造影或CDFI检查确诊DVT。患者无心、肺、肾及血液系统等严重疾病。两组年龄、性别等临床资料差异均无统计学意义(P>0.05)，所有DVT患者IVCF置入术及术后治疗随诊由同一组医师完成。

1.2 方法

1.2.1 仪器

采用德国西门子全数字减影血管造影系统和ALOKA 5，Phillips IU22彩色多普勒超声仪，探头频率2.0~4.0 MHz，贝朗VenaTechTMLP永久性IVCF。

1.2.2 操作

患者仰卧位，术前CDFI对下腔静脉、髂静脉、双侧肾静脉进行扫查，确认无变异和血栓等异常情况，排除腹腔占位性病变。患者局部麻醉后采用Sendinger技术经健侧股静脉穿刺插管，插入导丝，在X射线或术中超声联合X射线引导下，参照标记，沿导丝置入鞘管至肾静脉开口下方1~2 cm处，必要时下腔静脉造影，评估明确位置无误后释放滤器，撤回鞘管，滤器张开。压迫穿刺点完成整个穿刺过程。术后1周、3个月、6个月复查超声、X射线腹部平片。密切观察滤器置入位置有无偏移，穿刺部位有无血肿，下肢静脉及下腔静脉有无血栓及原有血栓大小变化，是否发生PE，临床症状有无改善，如肢体肿胀程度，肌张力以及肢体活动功能等。

1.3 统计学处理

采用SPSS 16.0统计软件进行分析。IVCF置入成功率、并发症发生率差异采用χ^2检验，置入时间、X射线照射时间数据用均数±标准差($\bar{x}\pm s$)表示，差异比较采用两独立样本均数t检验，检验水准为双侧α=0.05。P<0.05为差异有统计学意义。

2 结果

在超声联合X射线组50例患者中，47例完成IVCF置入。在X射线引导组36例患者中，34例完成IVCF置入。所有患者术中伤口局部出血<50 mL，X射线引导组发生穿刺部位血肿1例，局部血栓1例；超声联合X射线引导组局部血栓2例，穿刺部

位血肿1例。两组术后X射线示滤器位置良好，张开完全，无变形、移位。CDFI显示下腔静脉内未见血栓，滤器内血流充填好；术后CDFI及X射线复查随访1周至6个月，滤器位置良好，无偏移，无PE发生。患者原有临床症状缓解。两组IVCF置入情况对比情况见表1。

表1 超声联合X射线引导组与X射线引导组IVCF置入情况比较

Table 1 Comparison of IVCF placement effect between the group of CDFI guidance combined X-ray and X-ray guidance group

组别	*n*	置入时间/min	X射线照射时间/min	置入成功率/%	并发症发生率/%
超声联合X射线引导组	50	39.2 ± 6.3	7.8 ± 2.0**	94.0	6.0
X射线引导组	36	40.9 ± 5.6	11.5 ± 2.6	94.4	5.6

**：与X射线引导组比较，t=7.21，P<0.01。

**: compared with the X-ray guidance group, t=7.21, P<0.01.

3 讨论

下肢骨折后DVT是临床常见病及多发病，主要原因是由于下肢骨折后组织水肿以及肢体活动受限，引起血液在深静脉腔内不正常凝结，阻塞静脉管腔，导致静脉回流障碍。PE是其最严重的并发症，DVT如脱落进入肺动脉，可引起PE，大块PE可以致死。因此临床如何预防DVT脱落导致PE显得极其重要[4-8]。

目前，预防PE的最主要手段是置入IVCF。IVCF的主要原理是经外周静脉途径，利用特制的传送装置将带有滤器的金属支架置入下腔静脉，以阻止下肢深静脉内脱落的血栓进入下腔静脉，防止PE的发生[9-15]。X射线造影与超声是常用的术中引导置入IVCF的方法。X射线引导置入IVCF，通过术中注射造影剂进行血管造影，了解血管状况，这一方法准确、直观。但X射线有辐射性，造影剂具有肾毒性，部分有致敏反应，术前需检查肾功能，肾功能不全及过敏体质的患者禁用，其应用受到限制。彩超引导下IVCF置入，克服了X射线下置放滤器的缺点，对过敏体质及肾功能不全的患者是最佳的选择。但在实践中因气体、脂肪等因素干扰超声信号，肥胖、肠道气体较多的患者超声图像的质量较差，引导置入IVCF难度较大。本研究采用超声与X射线联合指导置入IVCF治疗50例下肢骨折后DVT患者，47例患者滤器位置均放在术前选择的最佳定位点，滤器张开完全，无变形、移位。术后患者原有症状消失，无PE等严重并发症。超声与X射线联合组与X射线引导组比较，X射线照射时间较短，组间比较有统计学意义。置入时间、置入成功率、并发症发生率等指标比较组间无统计学差异。这些结果与国内外报道[16-20]一致。本研究表明：IVCF置入治疗中，超声与X射线联合引导安全有效，并发症少，成功率高。两种方法相结合并合理应用，可弥补各自的不足，减少X射线辐射，提高置入IVCF的安全性和准确性，从而达到精准治疗骨折后DVT的目的。

综上所述，超声联合X射线引导IVCF置入术可预防PE发生，安全可靠，能弥补单一X射线引导的不足，减少放射线照射，优化治疗流程，具有较高的临床应用价值。

参考文献

1. Ha CP, Rectenwald JE. Inferior vena cava filters: current indications, techniques, and recommendations[J]. Surg Clin North Am, 2018, 98(2): 293-319.
2. Bikdeli B, Jiménez D, Kirtane AJ, et al. Systematic review of efficacy and safety of retrievable inferior vena caval filters[J]. Thromb Res, 2018, 165(4): 79-82.
3. Lane TR, Kelleher D, Franklin IJ, et al. Inferior vena cava filters: when, where, why?[J]. Phlebology, 2013, 28(4): 177-179.
4. 张福先, 张昌明, 胡路. 腔静脉滤器植入预防致死性肺动脉栓塞70例分析[J]. 中国实用外科杂志, 2005, 25(4): 215-216.
   ZHANG Fuxian, ZHANG Changming, HU Lu. Transplanting vena caval filter for the prevention of fatal pulmonary embolism: an analysis of 70 cases[J]. Chinese Journal of Practical Surgery, 2005, 25(4): 215-216.
5. 张庆桥, 祖茂衡, 徐浩, 等. 国产下腔静脉滤器在下肢深静脉血栓治疗中的应用[J]. 中国医学影像技术, 2007, 23(2): 265-267.
   ZHANG Qingqiao, ZU Maoheng, XU Hao, et al. Application of domestic inferior vena cava filter in the treatment of deep venous thrombosis of lower extremity[J]. Chinese Journal of Medical Imaging

Technology, 2007, 23(2): 265-267.

6. Wang W, Zhou D, Obuchowski N, et al. Fracture and migration of Celect inferior vena cava filters: a retrospective review of 741 consecutive implantations[J]. J Vasc Interv Radiol, 2013, 24(11): 1719-1722.
7. Kaufman JA. Inferior vena cava filters: current and future concepts[J]. Interv Cardiol Clin, 2018, 7(1): 129-135.
8. Ollila T, Naeem S, Poppas A, et al. Embolization of inferior vena cava filter tyne and right ventricular perforation: a cardiac missile[J]. Ann Thorac Surg, 2016, 102(6): e515-e516.
9. 程志远, 彭晓新, 张雁伟. 下腔静脉滤器预防肺栓塞及其并发症[J]. 中国介入影像与治疗学, 2007, 4(1): 19-22.
CHENG Zhiyuan, PENG Xiaoxin, ZHANG Yanwei. Inferior vena cava filter placement in the prevention of pulmonary embolism and its complications[J]. Chinese Journal of Interventional Imaging and Therapy, 2007, 4(1): 19-22.
10. 李敬府, 赵军, 王金锐, 等. 超声引导经皮穿刺下腔静脉滤器置入术的初步研究[J]. 中华超声影像学杂志, 2004, 13(7): 521-524.
LI Jingfu, ZHAO Jun, WANG Jinrui, et al. Initial experience of color Doppler ultrasound-guided interior vena caval filter placement[J]. Chinese Journal of Ultrasonography, 2004, 13(7): 521-524.
11. Mintz JD, Stavropoulos SW, Trerotola SO. Is a venacavogram necessary after inferior vena cava filter retrieval?[J]. J Vasc Interv Radiol, 2016, 27(12): 1857-1864.
12. 解银立, 张大春, 支兴兴, 等. 可回收下腔静脉滤器在骨折合并深静脉血栓中的应用[J]. 中国介入影像与治疗学, 2018, 15(2): 69-72.
XIE Yinli, ZHANG Dachun, ZHI Xingxing, et al. Application of retrievable inferior vena cava filter placement in patients with deep venous thrombosis after fracture[J]. Chinese Journal of Interventional Imaging and Therapy, 2018, 15(2): 69-72.
13. 贾中芝. 下腔静脉滤器常见并发症影像诊断与治疗策略[J]. 中国介入影像与治疗学, 2018, 15(3): 179-183.
JIA Zhongzhi. Imaging diagnosis and management of inferior vena cava filter related complications[J]. Chinese Journal of Interventional Imaging and Therapy, 2018, 15(3): 179-183.
14. Genovese EA, Jeyabalan G, Marone LK, et al. Endovascular management of symptomatic gastrointestinal complications associated with retrievable inferior vena cava filters[J]. J Vasc Surg Venous Lymphat Disord, 2015, 3(3): 276-282.
15. Poudel DR, Pathak R, Karmacharya P, et al. Stuck in the heart: embolized strut fracture of IVC filter[J]. Vasc Endovascular Surg, 2015, 49(3/4): 93-94.
16. Kim HO, Kim JK, Park JG, et al. Inferior vena cava filter insertion through the popliteal vein: enabling the percutaneous endovenous intervention of deep vein thrombosis with a single venous access approach in a single session[J]. Diagn Interv Radiol, 2016, 22(5): 455-459.
17. Tao MJ, Roche-Nagle G. Complications after long-term inferior vena cava filter placement[J]. CMAJ, 2017, 189(26): E892.
18. Yan JP, Li WQ, Wang ZF, et al. Application of contrast-enhanced ultrasound before inferior vena cava filter recovery[J]. Int Angiol, 2017, 36(5): 474-481.
19. Ganguli S, Hawkins BM, Abtahian F, et al. Comparison of inferior vena cava filters placed at the bedside via intravenous ultrasound guidance versus fluoroscopic guidance[J]. Ann Vasc Surg, 2017, 39: 250-255.
20. Liu Y, Zhou H, Chen C, et al. Assessment of the safety and efficacy of bedside ultrasound guidance for inferior vena cava filter placement in critically ill intensive care unit patients[J]. Ultrasound Med Biol, 2015, 41(4): 929-935.

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