早期非小细胞肺癌治疗计划中IMRT与VMAT单双拉弧的剂量学对比

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Title: Dosimetry comparison of IMRT and VMAT single and double arcing in the treatment of lung cancer

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摘要: 目的：研究容积旋转调强治疗的单双照射技术与静态固定野调强技术在早期非小细胞肺癌治疗计划的剂量学比较。方法：随机选取14例早期非小细胞肺癌患者，分别设计IMRT、双弧（Plan-d）和单弧（Plan-s）三种放疗计划，在靶区95%的体积达到处方剂量的条件下，反复优化并对比分析三种计划的同侧肺、对侧肺、心脏和脊髓的剂量学分布，以及治疗时间的长短等。结果：靶区适形度指数（CI）和不均匀性指数（HI）Plan-d要优于IMRT（$P<0.05$），而Plan-s与IMRT并没有太大差异（$P>0.05$）；Plan-d对同侧肺V20、V10和对侧肺V30、V20、V5的保护均优于IMRT有统计学差异（$P<0.05$），而Plan-s与IMRT并没有太大差异（$P>0.05$）；对于食管和心脏的保护，三种治疗技术并没有太大差异，但对脊髓的保护Plan-d和Plan-s却要优于IMRT；治疗总跳数（MU）和治疗时间（T）Plan-d和Plan-s也要少于IMRT（$P<0.05$）。结论：早期非小细胞肺癌患者的治疗，VMAT的Plan-d技术较IMRT无论是靶区剂量分布、OAR的保护还是治疗时间（T）都有着明显的优势，采用Plan-d能够极大的提高放疗增益比；若是由于其他原因没法用Plan-d技术，Plan-s和IMRT技术也是完全能够满足临床要求的。

Abstract: Objective：To study the dosimetric comparison between single and double pull arc technique of volume-modulated arc therapy and static intensity-modulated technique in the treatment planning of early non-small cell lung cancer.Methods：We randomly selected 14 patients with early stage non-small cell lung cancer (NSCLC) and designed IMRT,Plan-d and Plan-s radiotherapy plans respectively.When 95% of the target volume reached the prescribed dose.Comparative analysis of the three plans of ipsilateral lung,contralateral lung,heart and spinal dose distribution,as well as the length of treatment time.Results：The target conformality index (CI) and inhomogeneity index (HI) Plan-d were superior to IMRT ($P<0.05$),while Plan-s and IMRT were not significantly different ($P>0.05$),while there was no significant difference between Plan-s and IMRT ($P>0.05$).The protection of V20 and V10 on the ipsilateral lung was superior to that of IMRT.For the esophageal and cardiac protection,the three treatment techniques did not differ much,but Plan-d and Plan-s protection of the spinal cord was superior to IMRT,the total number of hops (MU) and treatment time (T) Plan-d and Plan-s less than IMRT ($P<0.05$).Conclusion：Compared with IMRT in VMAT,there is obvious advantage in the treatment of patients with early non-small cell lung cancer,whether it is the target dose distribution,the protection of OAR or the treatment time (T).Using Plan-d can greatly improve the radiation gain ratio.Plan-s and IMRT techniques are fully capable of meeting clinical requirements if double arcs are not available for other.

参考文献/REFERENCES

[1] Li Zhuangling,Zhong Heli,Li Xianming,et al.Dosimetric comparison of VMAT and IMRT after high-grade glioma surgery [J] .Chinese Journal of Medical Physics,2017,34(07):719-725,752. [李壮玲,钟鹤立,李先明,等.高级别脑胶质瘤术后VMAT与IMRT剂量学比较 [J] .中国医学物理学杂志,2017,34(07):719-725,752.]

[2] Ming XJ,Xu Z,Yin C,et al.Peripheral dose measurements in cervical cancer radiotherapy:A comparison of volumetric modulated arc therapy and step-and-shoot IMRT techniques [J] .Radiation Oncology,2014,9(1):1-7.

[3] Zhou Xieping,Wang Peng,Qian Liting,et al.Comparison of dosimetry between static intensity modulated radiotherapy for cervical cancer and single and two full-volume volumetric arcs [J] .Journal of Jilin University (Medicine Edition),2016,42(01):120-124. [周解平,王鹏,钱立庭,等.宫颈癌术后静态调强放疗与单个和2个全弧容积调强弧形治疗的剂量学比较 [J] .吉林大学学报(医版),2016,42(01):120-124.]

[4] Li Qingming,Wang Li,Sun Xinchen,et al.Comparison of clinical efficacy of conformal IMRT and volume rotation IMRT in advanced cervical cancer [J] .Chinese Journal of Medical Physics,2016,33 (05):478-480. [李丹明,王黎,孙新臣,等.中晚期宫颈癌适形调强放疗与容积旋转调强技术临床效果比较 [J] .中国医学物理学杂志,2016,33(05):478-480.]

[5] Sun Changjiang,Li Jun,Zhang Xizhi,et al.Dosimetric comparison of RapidArc-SBRT and IMRT treatment plans for lung cancer [J] .Journal of Basic and Clinical Oncology,2017,30(02):146-148. [孙长江,李军,张西志,等.肺癌RapidArc-SBRT与IMRT治疗计划的剂量学比较 [J] .肿瘤基础与临床,2017,30(02):146-148.]

[6] Guckenberger M,Richter AT.Is a single arc sufficient in volumetric-modulated arc therapy (VMAT) for complex-shaped target volumes [J] .Radiotherapy & Oncology,2009,92(2):259.

[7] Liu Jianping,Yang Haifang,Wang Zhiwu,et al.Application of partial arc volume rotation intensity modulation plan in central lung cancer [J] .Chinese Journal of Medical Physics,2017,34(11):1091-1095. [刘建平,杨海芳,王志武,等.部分弧容积旋转调强计划在中央型肺癌的应用 [J] .中国医学物理学杂志,2017,34(11):1091-1095.]

[8] Liu Jiabin,Niu Huarui.Dosimetric differences in rotational volume modulation,static intensity modulation,and three-dimensional conformal radiotherapy in patients with esophageal cancer in the entire segment [J] .Medical Equipment,2017,30(07):29-30. [刘佳宾,牛花蕊.旋转容积调强、静态调强与三维适形放疗在全段食管癌患者中的剂量学差异 [J] .医疗装备,2017,30(07):29-30.]

[9] Zhang Yanyan,Ouyang Ju.Progress in predictors of radiation pneumonitis after radiotherapy for lung cancer [J] .Modern Oncology,2017,25(07):1167-1170. [张燕燕,欧阳举.肺癌放疗后放射性肺炎相关预测因素研究进展 [J] .现代肿瘤医学,2017,25(07):1167-1170.]

[10] Lin G,Xiao H,Zeng Z,et al.Constraints for symptomatic radiation pneumonitis of helical tomotherapy hypofractionated simultaneous multitarget radiotherapy for pulmonary metastasis from hepatocellular carcinoma [J] .Radiotherapy & Oncology,2017,123(2):246-250.

[11] He J,Zeng Z,Shi S.105P:Risk factors associated with symptomatic radiation pneumonitis after stereotactic body radiation therapy for stage I non-small cell lung cancer [J] .Journal of Thoracic Oncology,2016,11(4 Suppl):S102.

[12] Deng Haijun,Zhao Yanqun,Luo Wenjuan,et al.Dosimetric study of postoperative IMRT and VMAT radiotherapy for cervical cancer [J] .Chinese Journal of Cancer Prevention and Treatment,2017,24(10):708-713. [邓海军,赵艳群,罗文娟,等.宫颈癌术后IMRT和VMAT放疗技术剂量学研究 [J] .中华肿瘤防治杂志,2017,24(10):708-713.]

[13] Shen Qin,Chen Nianyong,Li Guangjun.Application of volumetric rotation intensity-modulated radiation therapy in head and neck neoplasms [J] .West China Medical Journal,2016,31(09):1614-1617. [申芹,陈念永,李光俊.容积旋转调强放射治疗技术在头颈部肿瘤的应用 [J] .华西医学,2016,31(09):1614-1617.]

[14] Jo IY,Kay CS,Kim JY,et al.Significance of low-dose radiation distribution in development of radiation pneumonitis after helical-tomotherapy based hypofractionated radiotherapy for pulmonary metastases [J] .J Radiat Res,2014,55:105-112.

备注/Memo: -

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