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Evaluation of Elekta carbon fiber treatment couch model

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INTRODUCTION

The way in which the equivalent geometric model of the treatment couch is built into the planning system can accurately simulate the influence of the treatment couch in radiotherapy. The method of establishing an equivalent geometric model is convenient and fast, but usually the model structure is relatively simple and requires custom parameters. The model accuracy and parameter selection will directly affect the accuracy of radiotherapy. The study will compare and analyze the medical icoucha "iBeam evo Couchtop EP" carbon fiber treatment couch and the corresponding "Sample Elekta" geometric model, evaluate the radiation attenuation of the treatment couch and model under different conditions, determine the best electron density parameters of the model, and work for clinical work The use of medium treatment couchs and models provides a certain reference.

AIM

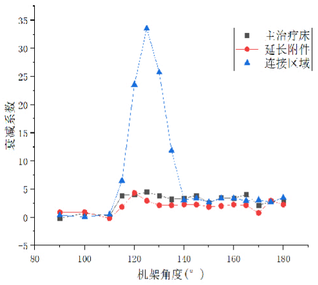
Based on the Monaco planning system, the medical Beacon iBeam evo Couchtop EP carbon fiber treatment couch and geometric model structure were compared and analyzed to evaluate its effect on dose attenuation in radiotherapy.

METHOD

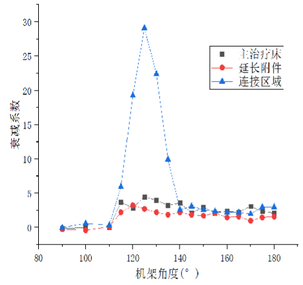
The CT scan iBeam evo treatment couch structure is compared with the virtual geometric model. Based on the Monaco planning system, a rapid test model of attenuation coefficient was established. Compare the expansion accessories of the treatment couch, the connection area, and the main treatment couch area with different incidence angles and attenuation coefficients under different energy conditions to determine the optimal electron density parameters of the built-in virtual treatment couch model.

RESULTS

Under 6MV (10MV) radiation conditions, the main treatment couch attenuation is 2.89±1.40% (2.42±1.37%), the connection area attenuation is 7.68±10.05% (6.52±8.64%), and the extension accessory attenuation is 2.00±1.01% (1.57±0.99%). The optimal electron density parameters of the carbon fiber shell and internal foam profile of the treatment couch model under 6MV radiation conditions are 0.3g/cm3 and 0.1 g/cm3; the optimal electron density parameters under 10MV radiation conditions are 0.4 g/cm3 and 0.1 g/cm3.



6MV X-ray treatment couch attenuation



10MV X-ray treatment couch attenuation

Virtual model C/F parameters (g/cm3)	Deviation deviation from actual treatment couch D	
0.4/0.02	6MV	10MV
0.4/0.02	-1.31±0.60%	-1.30±0.67%
0.2/0.1	0.36±0.87%	0.69±0.56%
0.3/0.1	0.02±0.64%	0.31±0.87%
0.4/0.1	0.31±0.85%	0.18±0.66%
0.5/0.1	0.58±0.75%	-0.36±0.61%
0.6/0.1	1.26±0.76%	- 0.36±0.90%
1.2/0.02	2.02±1.28%	1.45±0.95%

CONCLUSIONS

In radiation therapy, the effect of the treatment couch on dose attenuation cannot be ignored, and the attenuation in different areas of the treatment couch is different. Correct dating virtual treatment couch model can accurately simulate the influence of treatment couch in radiotherapy.

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