Study of optimal scheme of spinal image-guided radiotherapy based on expression of caspase-3 in spinal cord neurons by orthogonal design

W.L. Xu, J.L.T. Tayerjiang, X.B. Zhao, H. Wang, Q. Wang and H. Yuan

Department of Bone Surgery 1, People’s Hospital of Xinjiang Uygur Autonomous Region, Urumqi, China

Corresponding author: H. Yuan
E-mail: JingpingBAIcn@163.com

Received January 6, 2014
Accepted May 5, 2014
Published April 13, 2015
DOI http://dx.doi.org/10.4238/2015.April.13.1

ABSTRACT. The aim of the study was to optimize the biological safety scheme of spinal image-guided radiotherapy (IGRT) by determining the expression of caspase-3 in spinal cord neurons after IGRT. Thirty-six adult male beagles were assigned according to a random number table and subjected to IGRT to the 7th-12th canine thoracic vertebral bodies under a total dose of 80 Gy over 5 weeks. An immunohistochemical method was used to detect the expression of caspase-3 protein in spinal cord tissues, and real-time quantitative RT-PCR with SYBR Green I was used to detect the expression of caspase-3 mRNA in spinal cord tissues. Analysis of the orthogonal experiment results showed that caspase-3 expression in the spinal cord neurons was lowest when a single dose of 16 Gy was applied at a dose rate of 4 Gy/min, and field number of 9, with ray angle being equal. Thus, spinal IGRT showed high biological safety, and the best radiotherapy scheme for biological safety was single dose of 16 Gy at 4 Gy/min, with 9 fields and equal ray angle.

Key words: Image-guided radiotherapy; Spinal cord neuron; Caspase-3; Spinal biological safety; Orthogonal experiment