Purpose: The main problem considered in our investigation can be stated as follows: are there any radiobiological advantages of intentionally increasing fraction time?

Methods: By considering biologically equivalent doses to the target (BED1) and adjacent critical organ (BED2), we demonstrate that radiation protraction can be beneficial in the following sense: simultaneously increasing fraction time and monitor units can be used to maintain fixed BED2 while increasing BED1. In order to elucidate the obtained results, the considered approach is used to compare the effect of radiation protraction on step-and-shoot, prostate IMRT.

Results: It is shown that radiation protraction can be used to increase BED1 under certain conditions for tumor and normal cells radio-sensitivities, target and normal tissue fraction doses, and rates of sub-lethal damage repair.

Conclusions: radiation protraction can help increase BED to the target while maintaining fixed BED to the normal tissue.