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Mini Review

Management of Unscheduled Treatment Interruptions in Radiotherapy-Mini Review

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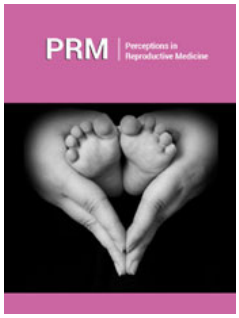

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Introduction

About four to six in ten patients (40-60%) with cancer need radiotherapy as a part of treatment. Conventionally fractionated radiation therapy, the most often used in clinical practice, delivers 1,8-2Gy single fraction per day, 5 times weekly, in 5-6 weeks and takes into account standard working practice of weekend breaks. In the last decade, the interest in hypofractionated irradiation, with the use of higher than standard fractional dose has increased significantly. The short-course irradiation or hypofractionated radiotherapy is the most frequent and preferred standard of care for radiotherapy during the pandemic [1]. At this point we are talking also about stereotactic radiotherapy based on high-precision delivery techniques and enabling the administration of a high radiation dose in one or a few fractions administered daily or non-consecutive days.

This highly precise technique is used in tumors of various locations. Generally, delivery of the total radiation dose in the planned, shortest as possible total treatment time is one of the main goals of radiotherapy. Clinical, logistic etc. activities to prevent interruptions in therapy should be a standard element of radiation treatment planning. Fast tumor cell division has been suggested as the main reason why prolonging overall treatment time negatively affects local control and survival in many human tumors like cervical cancer, head and neck squamous cell carcinoma, anal squamous cell carcinoma [2]. This is due to the accelerated repopulation of clonogenic tumor cells during radiotherapy as a response to tumor debulking. The generally accepted rule is that radical radiotherapy should not be interrupted. If interruptions are unavoidable, additional treatment to minimize the impact of prolonged treatment is needed.

Most Common Causes of Unplanned Interruptions in Radiotherapy

The most common causes of unplanned radiotherapy interruptions are public holiday, machine breakdown and service and patient related issues. The covid-19 pandemic significantly contributed to the increase in the percentage of patients who may require a break in radiation treatment [1]. Both the length of the break and the time it occurs seems to be important. The literature data from the second half of the 1980s show that a break lasting more than 10 days definitely deteriorates the results of radiotherapy [3]. Decrease of local control ranging from 3-25% for SCC of head and neck, cervix and lung has been noticed when a treatment time was prolonged of one week [4]. The correction of the interruption that occurred at the end of the irradiation may be more difficult to carry out than the one that occurred at the beginning.

Prevention of Unplanned Interruptions, Possible Solutions in the Event of their Occurrence

Depending on the circumstances that contributed to the unplanned interruption in radical irradiation, the solution may be: in the case of accelerator service or breakdown transfer the patient to another machine with the same or new plan of irradiation depending on accelerators compatibility,

a. In the case of public holidays, it would be ideal for the patients, especially those treated radically, to be irradiated without interruptions. In practice, it is usually impossible. The solution may be to administer some additional fractions of irradiation as described below

b. The strength of the impact on possible interruptions due to exacerbation of comorbidities or severe acute radiation reaction depends on the knowledge and experience of all medical staff. Adequately early treatment of inflammation in the field of planned irradiation, setting pharmacological treatment of internal diseases and early response to symptoms reported after the start of irradiation allows to reduce the risk of unplanned interruptions.

When conventionally fractionated irradiation has been interrupted by a few days, at the beginning of radiotherapy, an accelerated irradiation schemes can be used. Twice daily irradiation with a 6-hour break on some of the remaining days between the gap and the end of treatment can be administered [5,6]. When the above mentioned interruption occurs at the end of treatment, it may be advantageous to increase the remaining dose fractions. It should be remembered that the safe modification of the fractional or total dose resulting from unplanned irradiation interruptions requires the use of radiobiological-based calculations [7]. A detailed discussion of this issue is beyond the scope of the mini review. With regard to stereotactic radiotherapy, there are currently no reliable clinical data on the impact of unplanned interruptions in irradiation with this technique on tumor control. As mentioned in the introduction, stereotactic radiotherapy can be performed in one or few fractions. Of course, the impact of unplanned breaks does not apply to single-dose radiotherapy. There are some data suggesting that irradiation on non-consecutive days may leads to better tolerance and tumor control [8], so accelerated regime may be not appropriate for patient treated with stereotactic radiotherapy and after any unplanned breaks they should continue treatment on non-consecutive days.

Conclusion

a. Clinical, logistic etc. activities to prevent interruptions in therapy should be a standard element of radiation treatment planning.

b. Regarding conventionally fractionated radiation therapy delivery of the total radiation dose in the planned, shortest as possible total treatment time is one of the main goals of radiotherapy.

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