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BRACHYTHERAPY

COVID-19

Brachytherapy during the coronavirus disease 2019 – Lessons from Iran

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ABSTRACT

PURPOSE: COVID-19 outbreak is not a short-time crisis, and discontinuing or postponing life-saving treatments is not logical. Brachytherapy is one of the important treatment modalities for some subsites of cancers. Therefore, we decided to consider some of the best feasible brachytherapy regimes during the pandemic.

METHODS AND MATERIALS: We considered brachytherapy guidelines and landmark trials and selected the most efficacious indications of brachytherapy, considering the best regimens to minimize the risk of exposure to the novel coronavirus.

RESULTS: We developed appropriate recommendations amid the COVID-19 pandemic for brachytherapy management of cervical, endometrial, breast, prostate, head and neck, and soft-tissue sarcomas.

CONCLUSIONS: Brachytherapy provides an opportunity for the patients and the physicians during the COVID-19 outbreak; it can retain the patient's chance for treatment while limiting the chance of exposure and transmission of infection. © 2020 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

Keywords:

Brachytherapy; COVID-19; Iran

Iran is in a dire situation as a result of the coronavirus disease 2019 (COVID-19) outbreak and reported its first confirmed case of COVID-19 infections on 19 February 2020 (1), and it was one of the first countries to deal with the corona epidemic. We have been fighting with the novel coronavirus for more than 3 months in Iran. COVID-19 mortality rate is higher in patients with cancer (2), and the COVID 19 pandemic poses severe challenges in the treatment of patients with cancer. At the onset of the outbreak, discontinuation, or postponing, the nonemergent treatments were considered. However, as time passes, we realize that COVID-19 is not a short-term crisis. Estimates are suggesting a long-lasting pandemic, perhaps for months. Therefore,

it is not logical to deprive patients of life-saving treatments. Besides, quarantine policy in our country and many parts of the world are different from China. People have different levels of exposure with the novel coronavirus, and some patients may have a higher chance of receiving necessary, timely, and effective treatments.

Delaying radiotherapy in some patients will reduce the efficacy of this treatment and will affect the patient's survival. In addition, it can cause a high mortality rate for patients and also place a higher financial burden on the health system after the COVID-19 pandemic is over. Therefore, canceling or too much delaying of the available treatment options does not seem logical. In this regard, we, in Iran Cancer Institute, have taken our policy to provide safe treatment options for patients with cancer with the maximum level of patient and personnel protection.

Brachytherapy is an efficacious modality in cancer treatment, combining optimal tumor-to-normal tissue gradients to save normal tissues. It can be delivered within a few days, compared with external radiotherapy (ERT), to decrease the overall treatment time, so that it causes patients a lower risk of COVID-19 infection. These advantages make brachytherapy a viable treatment option in the novel coronavirus era.

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Brachytherapy treatment considerations during the virus pandemic

We have decided to limit the brachytherapy to patients in whom the validated guidelines or recommendations have proven its efficacy. We abstain from delaying patients' brachytherapy, and our rationale is that it is vague for everyone that the pandemic would be under control in the coming months or not.

The patients undergo a thorough physical examination, with particular attention to the common symptoms and signs of COVID-19 infection such as sore throats, respiratory symptoms, myalgia, fever, or nontypical symptoms and signs (anosmia, red eyes, diarrhea, and so on.) Besides physical examination, we take a complete history of any exposure to the case of COVID-19 infection by the patient. A normal chest X-ray is necessary to admit the patient for any procedure requiring anesthesia. Moreover, and in suspicious patients, we check the status of infection by the spiral chest CT scan and COVID-19 polymerase chain reaction test. For a patient with the symptoms of COVID-19 infection, we pause the treatment process, meanwhile the patient undergoes infectious diseases consult.

- In COVID-19—confirmed patient, we interrupt the treatment for at least 2 weeks after the patient becomes symptom free or two negative COVID-19 polymerase chain reaction tests are required for restarting the treatment.
- We have given our priority to local or spinal anesthesia as far as possible; general anesthesia should be avoided whenever it is possible owing to the risk of contamination of operating room staff or patients.
- We have attempted to limit the patient's probable exposure to COVID-19 by escalating dose per fraction and reducing the number of fractions in case the dose homogeneity is kept well, and the organ at risks (OARs) are not compromised.

Cervical cancer

Brachytherapy is a crucial part of locally advanced cervical cancer (3). The prolongation of the overall treatment time has resulted in more unfortunate outcomes in patients (4). Therefore delaying the treatment is not recommended in any case of locally advanced cervical cancer, except in the presence of confirmed or suspicious COVID-19 infection. In our center, we recommend achieving the total dose 85-95 Gy EQD2 for high risk-clinical target volume, hence with a higher dose per fraction if possible (5). We consider dose constraints, and in case the OARs are compromised, we use more fraction numbers.

Endometrial cancer

Postoperative brachytherapy in endometrial cancer is performed under specific conditions. We use a cylinder

for this purpose. We recommend the routine treatment of radiotherapy for this group of patients without any delay, while we prefer to deliver the dose in three instead of four or more fractions to limit the chance of exposure.

Breast cancer

In the case of early-stage breast cancer suitable or cautionary for accelerated partial breast irradiation, we recommend balloon- or multicatheter-based brachytherapy instead of ERT for shortening the treatment duration (6). Balloon- or catheter-based accelerated partial breast irradiation is preferred to be inserted intraoperatively or by local anesthesia or sedation in the postoperative setting.

Head and neck cancers/skin cancer

Owing to the need for intubation during catheters insertion, it is highly recommended to rule out patients infected by COVID-19 before brachytherapy, and screening should be performed before anesthesia. In accordance with our experience, we perform adjuvant brachytherapy for patients with pT1-T2, N0 oral tongue cancer who have a high risk for local recurrence (closed margin, perineural and lymphovascular invasion or high depth of invasion) by 39 Gy in 13 fractions in 7 days, two times daily instead of 60 Gy in 30 fractions by ERT (7). In nonmelanoma skin, cancer brachytherapy is a good option for treatment in inoperable patients or the sites that surgery could have unacceptable cosmetic results (8). Fewer fractions of brachytherapy and similar effectiveness in non-melanoma skin cancers compared with ERT gave us a unique opportunity to treat our patients with lower exposure to COVID-19.

Prostate cancer

The role of brachytherapy in prostate cancer treatment is inevitable. High-dose-rate brachytherapy is an attractive modality for prostate cancer treatment. Optimized dosage for CTV and OARs, coverage of seminal vesicles, and periprostatic tissue are among the advantages of this method. In the corona outbreak, brachytherapy gave us the opportunity to treat patients with less exposure to the virus and less hospital stay compared with other costly modalities such as radical or robotic surgery and intensity-modulated radiation therapy.

When the intention of treatment is monotherapy in a low-risk patient with prostate cancer, we recommend delaying the treatment for 3–6 months. In high-risk patients who require brachytherapy as a boost, our recommendation is avoiding any delay in patient's treatment; we prefer to deliver 13.5 Gy per fraction for two fractions for brachytherapy alone (9) or 15 GY for booster dosages after ERT in one session (10).

Soft-tissue sarcoma

Brachytherapy is a viable option amid the COVID-19 pandemic for soft-tissue sarcoma in adjuvant settings. As

the recommended adjuvant external beam radiation therapy dose for sarcomas is 60–66 Gy with 1.8–2 dose per fraction, brachytherapy alone is a reasonable option in patients with known indications and especially in perioperative settings (11). We recommend high-dose-rate rather than low-dose-rate with iridium-192 wires for decreasing the patients' hospital stay duration.

Miscellaneous cases

In some miscellaneous cases, such as uveal melanoma, palliation of symptoms in esophageal cancer, or cholangiocarcinoma, the only option we have is brachytherapy, and we prefer to avoid delaying the treatment in such cases.

Conclusion

Considering the COVID-19 pandemic besides the necessity of cancer treatment for patients with cancer, brachytherapy provides an opportunity for the patients and the physicians amid the COVID-19 outbreak; it can retain the patients' chance for treatment while limiting the chance of exposure and transmission of infection, but maximum personal protection is essential to avoid infection for patients and healthcare workers against the novel coronavirus.

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