Multiple Myeloma in Post Nuclear Accident Crisis

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Abstract The problem of 2011 nuclear accident crisis draws attention of physicians and medical scientists around the world. The cancer induction is an important adverse effect of exposure to radionuclide. In this specific article, the multiple myeloma, an important hematological cancer, in the post nuclear accident crisis will be discussed.

Keywords Nuclear · Accident · Multiple myeloma

Introduction

The big Japan Earthquake 2011 causes destruction of the nuclear electricity plant leading to nuclear crisis. This crisis draws attention of physicians and medical scientists around world. The health consequences of exposure to ionizing radiation from the accident are the main public health issues in post crisis. The cancer induction is an important adverse effect of exposure to radionuclide. There is some evidence that exposure plays major roles in carcinogenesis of many cancers, especially for thyroid cancer [1]. In this specific article, the multiple myeloma, an important hematological cancer, in the post nuclear accident crisis will be discussed.

Change in Epidemiology of Multiple Myeloma in Post Nuclear Crisis

There is some epidemiologic evidence of multiple myeloma relating to ionizing radiation exposure in post nuclear

crisis. Several evidences are from a well-known nuclear accident crisis, the Chernobyl case. Similar to other cancers, the morbidity of multiple myeloma increased among people living in highly contaminated areas [2]. Gluzman et al. studied on the epidemiology of hematological malignant diseases of Chernobyl clean-up workers and found that multiple myeloma was an important malignancy with a similar prevalence rate to myeloid leukemia [3]. It is reported that the prevalence of multiple myeloma in the group of patients belonging to clean-up workers was about two times higher than that of the general population [4]. Of interest, an increased number of multiple myeloma cases among radiation exposed subjects could be observed. In two studies among the same exposed population at 18- and 20-year post exposure period, the higher prevalence could be seen at 20-year period [3, 4]. Most malignancies occurred during the tenth and twentieth year [3, 4]. Most patients were adult males (but the studies are usually on male Chernobyl) [3, 4]. However, the main problem in almost all epidemiological reports is the accuracy of diagnosis of multiple myeloma [5].

The Pathogenesis of Multiple Myeloma and Nuclear Accident Crisis

It is no doubt that radionuclide can induce cellular abnormalities. Based on the registry data, the estimated radiation dose for the cases with hematological problems is varied [6]. However, it is excessive than normal acceptable limit. Based on the Chernobyl crisis, the estimated sudden giving out radiation dose is as high as average natural dose of radiation accumulated every year by an individual [7]. Therefore, there is no doubt that disturbance of cells genome can occur [7]. It is believed that radiation can alter

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cellular structure resulting in carcinogenesis. Nevertheless, the exact mechanism has not already been proven. There is no report on chromosomal abnormalities in multiple myeloma although it is widely reported in other hematological malignancies [8]. Gluzman et al. proposed that “Only the precise diagnosis of hematopoietic malignancies combining with large-scale analytical epidemiological studies with careful dose assessment and long-term follow-up may represent the basis for resolving the question whether mature B-cell neoplasms may be radiogenic [9].” Due to the problem on accuracy of diagnosis, it is not logical to conclude that there is an increased risk of multiple myeloma after nuclear crisis [10, 11].

Treatment of Multiple Myeloma in Post Nuclear Crisis

There is no specific treatment for multiple myeloma in post nuclear crisis case. The best technique is still bone marrow transplantation, which is limitedly available in large medical center. According to a report in the post Chernobyl crisis, Uss et al. reported their experience that “There was nothing unusual about the post-transplantation period [12].” The complications are graft-versus-host disease, septic shock, veno-occlusive disease, bleeding and intestinal pulmonary fibrosis [12]. There is no specific recommendation for post transplantation management. Exposure to the persistent low-level of radiation does not cause any problem. With the present stem cell technology, use of cord blood stem cells can be a good alternative choice that can reduce graft-versus-host problem [13]. However, since this is a new technique that is not available at Chernobyl crisis, there is no clinical trial to support its efficacy.

Conclusion

The incidence of multiple myeloma increases after nuclear accident crisis. However, the underlying mechanism of contaminated radionuclide in induction of cancer is not known. It is an interesting issue for further studies.

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